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THE UNIVERSITY OF ALBERTA

THE PERCEPTION OF CLIMATIC VARIABILITY AND THE DECISION MAKING PROCESS AMONG FARMERS OF WEST CENTRAL ALBERTA.

BY

©

CATHERINE ANN HOOEY

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF ARTS.

DEPARTMENT OF ANTHROPOLOGY

EDMONTON, ALBERTA
FALL 1988

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled THE PERCEPTION OF CLIMATIC VARIABILITY AND THE DECISION MAKING PROCESS AMONG FARMERS OF WEST CENTRAL ALBERTA submitted by CATHERINE ANN HOOEY in partial fulfillment of the requirements for the degree of MASTER OF ARTS.

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Date: June 24, 1988

ABSTRACT

When culture change and climate change occur contemporaneously, the tendency in the past has been to link them in a direct way, implying a causal relationship. Such deterministic interpretations see culture as a group phenomenon and culture change as a group response to climate change. If culture change is defined as a collection of individual responses, rather than as a group response, the culture-climate change relationship can be considered from a different perspective. An investigation into the way individuals make decisions in response to perceived climate change is the logical place to start a study of the relationship between climate change and culture change, as climate is perceived and culture change initiated at this basic, individual level.

This thesis is an investigation of the role of the perception of climatic variability in the individual decision making process of farmers of west central Alberta. Six long-time Edson area farmers were interviewed in-depth in order to understand how they perceive climatic variability and how their responses to it are reflected in the planning of their farm strategies.

From this study, it was determined that climate perception is a unique, individual process and that

decisions cannot be predicted. Consequently, predicting the direction of culture change is unrealistic. The ideology of the farmers, including the value of the farm lifestyle, the denial of the risk of climatic variability, and the belief that the financial aspect of farming is more of a risk than climatic variability, has an important influence on the decision making process.

The coincidence of culture change and climate change does not constitute an explanation. Other variables must be investigated when seeking an explanation for culture change in the past. A study of the individual perception of climate change in a high resolution situation is ideal for investigating the basic unit of perception, that of the individual, in research into the relationship between climate change and culture change.

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CHAPTER I

INTRODUCTION

The temporal and spatial coincidence of climate change and culture change has often led to causal interpretations; researchers have assumed a direct, one way, cause and effect relationship between climate and human activity (Warrick and Riebsame 1983:20). Reeves (1973:1222), for example, notes that researchers have assumed a direct relationship between climate and culture change in order to explain the cultural hiatus on the Northern Plains during the first half of the mid Holocene Altithermal. Adverse climatic conditions from 7500-5000 B.P. coincided with the abandonment of the area by prehistoric bison hunting cultures (Reeves 1973:1221). The scarcity of archaeological sites suggested to Frison (1975:296) decreased occupation on the Great Plains during the early Altithermal drought. Irwin-Williams and Haynes (1970) envisioned a gradual retreat from the Plains by the big game hunters after the Clovis period due to a decrease in moisture and the resulting desiccation of the area. Population increase and increased cultural complexity after about 3000 B.C. have been linked to the increase in moisture at the close of the Altithermal (Irwin-Williams and Haynes 1970). Although more recent evidence indicates that the plains were not completely abandoned (Hurt 1966; Stephenson 1965:692), and that a lack of archaeological evidence and inadequate sampling does not necessarily constitute evidence of abandonment, numerous authors accept the assumption that the coincidence of climate change and culture change is evidence of a causal relationship. This, in turn, is used as a basis for subsequent work (Reeves 1973:1222-23).

The demise of the Norse settlements in Greenland provides another example. A warm ice-free period from circa 860-1200 A.D. allowed for the westward exploration of the Atlantic by Europeans (Wahlgren 1986:25). The Norse established two major settlements in Greenland. The Eastern Settlement was established circa 986 A.D. and eventually included 190 farms, a cathedral, a monastery and a nunnery. The Western Settlement was well established by 1300, with 90 farms and four churches (Jones 1984:293). According to Logan, these were fairly large, properous, farming communities where cattle and sheep grazed on pasturage (Logan 1983:75).

The Western Settlement was deserted by about A.D. 1340 (Jones 1984:308), and the Eastern Settlement had ceased to exist by A.D. 1500 (Logan 1983:77). Climatic deterioration during the 13th century, marked by a sharp increase in pack ice circa 1260 (Wahlgren 1986:24), has often been blamed for the abandonment of the Greenland settlements. Pohl postulates that the worsening climate forced farmers to switch to a hunting and gathering subsistence, which ultimately resulted in emigration from the Western settlement (Pohl 1972:310). Stromsted (1974:41) agrees, stating: "worsening living conditions for the Greenland colonists... shows good cause for all of them to seek better lands."

Climate change has also been evoked to explain the 13th century land abandonment by the Anasazi in the American Southwest. Douglas (1929) was the first to suggest that a Great Drought, indicated by late 12th century tree rings, coincided with Pueblo abandonment and he postulated a cause and effect relationship. Many years later, Schoenwetter and Dittert (1968) concluded that environmental change has been the critical independent variable in Southwestern culture change. Berry (1982:126) maintains that "Drought-induced population dislocation was a recurrent feature in Anasazi prehistory". He claims that there is "strong evidence that climatically-induced migrations occurred frequently", and that the "plateau-wide abandonment of the late Pueblo III sites by A.D. 1280 was a consequence of drought" which resulted in the migration of people to high elevation sites (ibid). Berry points out that the northward movement of the Pueblo IV Anasazi people circa A.D. 1360 is coincidental with a "return to more mesic climatic conditions" as evident in the tree record (Berry 1982:110). Berry explains that "smooth transformational continua [in the Southwest] occur infrequently if at all", and that the southwestern cultural evolutionary sequences are "characteristically punctuated" and these abrupt changes can be related to the tree ring record (Berry 1982:110).

As these examples illustrate, temporal coincidence of climate change and culture change as seen in the archaeological record has been accepted as the only evidence required to establish a direct causal relationship between the two. This approach to explaining cultural change is based on a number of frequently employed assumptions, which are neither stated nor adequately explained. These are that:

1. Culture change can be solely attributed to climate change.
2. The temporal coincidence of culture change and climate change is proof of cause and effect.
3. Culture is a collective "thing", not an individual experience.
4. A change in climate results in a collective response by a group of people.
5. All of the people within the affected group share a

common perception of climate change and react to it in a consistent manner.

6. Culture remains relatively static and makes leaps of change when the environment changes (Similar to Wendland and Bryson´s [1974:10] step-wise model of climate change).

7. The underlying definition of culture is that it is learned, shared, and results in similar perceptions of the social and biological environment.

These assumptions can be summarized by the following statements:

A. Culture is at the mercy of the environment; it has no choice but to change by means of a collective response as the environment changes.

B. Culture goes through periods of stability and change. Climate change is all that is needed to explain culture change, particularly when they occur contemporaneously.

Culture is a word used to describe a group of people, as well as a concept employed in anthropology to explain differences in human adaptations. The collective definition is most frequently used in archaeology to denote an archaeological culture that has a physical record of development and change, such as the Thule or the Anasazi. This is, in part, where difficulties arise with the hypothesis of culture change-climate change as employed in archaeological explanations (see assumptions).

Recent developments in anthropology have tended to emphasize the role of the individual in the concept of culture. Spradley and McCurdy (1987:3) define culture as "the acquired knowledge that people use to interpret their world and generate social behaviour"; it "is the system of knowledge by which people design their own actions and interpret the behaviour of others." This definition emphasizes the individual use of knowledge to determine behaviour, a significant departure from the collective approach to culture that has been used in the past in archaeological explanations of culture-climate change.

Spradley and McCurdy (1975:596) define culture change as "the process by which some members of a society revise their cultural knowledge and use it to generate and interpret new forms of behaviour." Keesing (1974: 91) states "... it is individuals, making choices, pursuing strategies, maximizing values, forming coalitions, that generate the patterns of social life." Culture change, then, results from an individual response to a changing environment: in this context, a climatic change. Culture change at the societal level is, therefore, the accumulation of individual decisions regarding environmental or climatic change. Culture change becomes the accumulation of decisions made by individuals to change their behaviour.

This approach to culture change provides an important entré for research into the culture-climate change hypothesis. Individuals perceive changes in their environment and use this perception to formulate an appropriate behavioural response. This is a critical question in the research strategy: what is the role of individual perception in the decision making process which leads to the "new forms of behaviour" (Spradley and McCurdy 1975:596)? More specifically, how do individuals perceive a changing environment (climate) and how do these perceptions enter the decision making strategy? It becomes, therefore, necessary to first investigate individual perception of climatic variability and change. From this understanding, research can focus on how these perceptions shape individual decisions and strategies and how individual decisions might collectively be seen as culture change.

Spradley and McCurdy (1975:596) view culture as in a state of constant change due to numerous variables, in addition to environmental factors. The question must be raised as to whether or not culture change can ever be attributed solely to climate change: whether that component that might be attributed to climate is even separable from all other factors that impinge on individual decision and collective response? Schweger (1987:8) emphasizes this point by questioning "... whether rapid cultural change, or for that matter, slow progressive change spread over generations, can ever be attributed to the environment or climate." (Schweger 1987:8). To the researcher, it is important, therefore, that the contribution of other factors be considered when investigating the reasons for culture change (especially when it occurs simultaneously with climate change).

Invoking climate as the sole determinant of human events is rarely justifiable (Kates 1985:33) and leans towards environmental determinism, which neglects the many interacting variables involved in climatic change and human adaptation (Warrick and Riebsame 1983:21). Researchers have now begun to focus their investigations on alternative influences which may contribute to culture change. For example, while investigating the climate-culture change relationship, Parry (1978:117) noted a coincidence in the retreat of cultivation and the increase in submarginality in the areas of highland farming in southeast Scotland at the end of the 16th century. Following a review of the settlement data, including monastery accounts, tax and census records, and the proxy weather data, Parry concluded that, despite the temporal and spatial coincidence of land abandonment and changing climate, a whole range of social, economic and political factors provided the immediate stimulus for land abandonment. The relationship was not necessarily a causal one. Population decline caused by a 14th century plague, the alienation of lands from the monasteries and the repeated invasions by English armies from the south all contributed to the abandonment of the land (Parry 1978:118). Long term climatic change beginning in the mid 13th century decreased agricultural potential, thus compounding the effects of the historic factors, and these historic factors probably forced the individual decisions to abandon farms (Parry 1978:119).

The coincidence between economic stress, land abandonment and climatic deterioration in northern 18th century Iceland was investigated by Ogilvie (1981). Strong glacial advances in the 1690s, early 1700s and the 1750s marked the colder periods of the Little Ice Age which were characterized by severe winters, cold rainy summers and a noteable increase in sea ice (Ogilvie 1981:58-59). At the same time, much of northern and northeastern Iceland was abandoned as people moved further west and southwest to where the climatic conditions were not as severe. This in-migration of people placed tremendous pressure on local populations, resulting in an increase in both crime and mortality (ibid). After examining the historical data, Ogilvie concluded that a combination of factors, including pressure from the Danish monopoly, the system of land tenure, disease, the frequency of severe seasons and "other less well-defined factors" (Ogilvie 1981:59), brought about the difficult socio-economic conditions that resulted in land abandonment in some regions of Iceland.

The above examples focused on high resolution situations or situations where "the rates of cultural and environmental change can be precisely determined" (Schweger 1987:8) through the use of climatic data and historic settlement records. Such situations are most suitable for examining the culture-climate change hypothesis, since all potential influences on culture and culture change can be critically evaluated. Applying Spradley and McCurdy's definition of culture, where individual perceptions lead to decisions, in a "high resolution" research situation is the ideal approach to investigating the culture-climate change hypothesis. Following this approach, this thesis is an investigation into individual perception of climate change and its role in the decision making process, the results of which may then serve as a basis for better understanding of the culture-climate change relationship. The role of risk perception and its influence on the perception of climatic variability is also worth investigating, since perceived risk is the product of environmental perception that has occurred in the past, and affects the perceptions of the present. This study, as recommended by Schweger, is set in a high resolution situation, the type of situation also researched by Parry (1978) and Ogilvie (1981).

CHAPTER II

METHODOLOGY

Selecting The Study Area

A contemporary agricultural setting which fulfills the requirements of a high resolution situation is ideal for research into the relationship between climate change and culture change. Agriculture is obviously dependent on climate, yet the success of a farm operation depends on the ability of the individual farmer to perceive and react to climatic variation in a manner appropriate to his farming strategy. Individual perception, evaluation of that perception, and acting on that evaluation are necessary steps in planning any farming operation.

To undertake this investigation, therefore, it was necessary to find an agricultural area located in a high resolution situation where both climatic data and settlement records were available. Carter and Parry (1984) and Parry (1978:74) suggest that marginal lands, which are stressed even during normal climate conditions, are ideal "laboratories" for the study of the relationship between climate and culture. Marginal land is defined as being especially sensitive to changes in the environment and resource availability, and where climate is considered to be a resource (Carter and Parry 1984). Marginality, however, is not limited solely to climate. Carter and Parry (1984) recognize three types: spatial/geographic, economic, and social marginality.

"Spatial/geographical marginality" refers to those lands located at the edge of a region. In this instance, a region is defined on the basis of climate, soil type, vegetation type or any other biophysical element. An example of a spatially/geographically marginal farm is one that is found ~~at the fringe~~ of an area which is ideally suited to a particular type of farm operation. The marginal farm is not well suited to its variable environment due to its location and is subject to greater stress than a farm located more centrally, in a better suited environment (Carter and Parry 1983:1). Fringe lands, at the margin of agricultural capability, are highly susceptible to the even slightly adverse impacts of non-favourable climatic variations (Kates 1985:20).

"Economic marginality" describes land where "returns on a given activity barely exceed the costs" (Carter and Parry 1984:3). This term can be quite usefully applied to farms where the cost of running the operation is more than the profit. Whether or not a farm is economically marginal ultimately depends on the ability of the farmer to perceive his physical, economic and social environment and make appropriate decisions with regard to it.

"Social marginality" makes particular reference to underdeveloped populations which are forced into geographically marginal areas that offer few adaptive mechanisms for survival (Baird et al 1975). However, in the context of western Canadian agriculture, this is not an appropriate definition. A farm that lacks access to the latest technology, to appropriate funding assistance, or perhaps lacks access to social support systems might be considered socially marginal. In this way, social marginality might refer to a situation where the farmer, lacking a family and friends to help pull him through difficult times, suffers too much of a loss and has to sell the farm.

These three types of marginality are not necessarily related. That is to say, an economically marginal farm may not necessarily be located on geographically marginal land and geographically marginal farms are not necessarily economically marginal (Carter and Parry 1984). An area displaying exclusively geographical marginality would provide an ideal location for an investigation into the climate-culture change relationship (Kates 1985:20), for in such areas, the effects of climate change will be all the more visible (Carter and Parry 1984:3). Farming in marginal areas places additional importance on the role of perception and strategy. Interviewing farmers in marginal areas is the first step in explaining the the role of individual perception in that process.

Western Canadian, more specifically western Albertan, agriculture has often been described as marginal in reference to climate, soil, and agriculture, and therefore provides an ideal situation for this investigation. The Edson area of west central Alberta satisfies Carter and Parry's (1984) definition of geographic marginality (and is readily accessible from Edmonton). This area lies in the southern boreal forest, close to where the boreal region borders onto the parklands to the south and east (North 1976) and can be described as exhibiting "a high degree of risk resulting from climatic change and variability" (Carter and Parry 1983:1). The relatively high elevation of the land increases the risk of frosts early and late in the growing season, making it impractical to grow wheat (Dumanski et al 1972:29).

Regardless of the risk involved, farmers have persisted for more than sixty years in their endeavours to farm this land. Provincial and federal agricultural authorities have recognized the marginality of the Edson area due to the climate and the soil type, which results in crops of "clearly inferior" nutritive value when compared to crops grown in other areas of Alberta (University of Alberta and Canada Department of

Agriculture 1971:29). They recognize that problems exist in "fringe areas" not only due to the low nutritive value of the crop, but also because of the high transportation costs, which result in reduced prices being paid to the farmers (University of Alberta and Canada Department of Agriculture 1971:30).

Agricultural history in this region is recent and many of the farmers who homesteaded the area in the 1920s and 1930s are still on the farm. As informants, they can provide a wealth of information regarding the settlement and development of the area. Climatic records, including temperature and precipitation records for the Edson region, date back to as early as 1914. Consequently, the region serves as an ideal high resolution situation and was selected for this research project.

Many of the references in this thesis are from Agriculture Alberta sources. This was considered appropriate, not only because the study involves agriculture, but it is important that the region be described as agricultural authorities see it; i.e. in terms of the environmental factors and how they limit agricultural capabilities.

Informant Interviews

This study of climate perception by marginal farmers was completed using an empirical rather than a normative approach (as defined by Ilbery 1985 :7), since "... only empirical tests can show whether or not environmental factors are determinitive of cultural factors" (Watson et al 1984:115). "In-depth case studies" (Whyte 1977:21) were made of several farmers. These included their farm histories as well as the ideas, perceptions, and views that enter into the decision making process, including their perceived success.

This approach was used for the following reasons:

1. This method would yield more appropriate information than a large sample acquired through the use of questionnaires or "surface surveys" (A. Whyte 1977:21) as the questions to be asked were not suited to a simple "yes" or "no" answer.

2. It is quite likely that many factors play a role in planning farm strategy and that some of these may become more evident in an interview setting than through the use of a formal questionnaire.

3. Many of the questions that were to be asked would depend on individual circumstances.

4. The reaction to certain questions may be just as valuable as the verbal response itself.

5. During an interview, the correlation between the perceptions of environmental change and the coinciding response may be difficult to discern and may become evident only later upon the transcription and

interpretation of the tapes.

6. The interview method would allow for flexibility in questioning and allow the interviewer to follow up on leads as they arose.

7. It was likely that each interview would produce "unique information" (A. Whyte 1977:38) which might well prove to be especially valuable. As A. Whyte (1977:38) points out, seemingly inconsequential remarks can "reveal important information when considered in context of that and other interviews".

Contacts with informants in the Edson region were initially made through references from people in the town of Edson. Potential informants were told of the nature of the project, how the information was to be used and by whom, and were assured of total anonymity. The preferred informant was a farmer who had farmed in the area for a long time, preferably someone who had homesteaded in the area and was still on the farm. These individuals would have considerable experience, not only with farming and planning farm strategy, but also with climatic variation and environmental change.

Fifteen farmers or former farmers were interviewed to assess their suitability. During the first meeting with each farmer, general questions regarding farm operations, farm history and changing weather patterns were asked. Of the six farmers who were chosen to be extensively interviewed, only three were original homesteaders. Unfortunately, three others with this background lacked adequate recall and as a result, three farmers who had taken over the family homestead from their fathers were selected.

An average of 8 - 10 hours was spent with each informant over 4 or 5 interview sessions. The same basic questions were asked of each informant, and elaborated upon as necessary. A sample of these basic questions is found in Appendix I. All informants were very willing to talk and had definite opinions on farming in the Edson area. All were able to provide valuable information and were hospitable and cooperative in every way.

CHAPTER III

BACKGROUND: THE EDSON REGION

The Edson Region

The town of Edson (53°35′ N, 116°25′ W) is located 120 miles west of Edmonton, Alberta, 70 miles east of the Jasper National Park entrance, in Provincial Improvement District 14 (an unincorporated municipality). It serves as a distribution center for a region which includes a number of smaller communities. The Edson region lies in the foothills on the eastern edge of the Eastern Rockies with an average elevation of 896 meters above sea level. This is a region of gently undulating and rolling topography (Dumanski et al 1972:13) with moderately heavy forest cover consisting of aspen, balsam, poplar and lodgepole pine (Dumanski et al 1972:22) with very little open grassland (North 1976). The region is rich in natural resources, including oil, natural gas, coal mining, forest production and agriculture, although it is situated in what has been called the "pioneer" area of Alberta. Grain crops occupy less than 10% of the land under cultivation and the agricultural capability is limited (Murchie

1936:39). As a result, mixed farming is recommended (University of Alberta and Canada Department of Agriculture 1971:28).

Soils

The Edson area is located on the Eastern Alberta Plains portion of the Interior Plains physiographic region (Government of Alberta 1969). Peat soils and muskegs are prevalent in the area (University of Alberta and Canada Department of Agriculture 1971:82) and the stoniness varies from slight to moderate; most stones are less than two inches in diameter (U. of A. and Cda. Dept. Agric. 1971:37), which may cause some interference with cultivation (Dumanski et al 1972:116). It is an area of gray wooded soils which are leached and low in humus content (U. of A. and Cda. Dept. Agric. 1971:9). The gray wooded soil zone of western Alberta is generally characterized by "a very thin or absent leaf layer and organic mineral layer below which is severely leached and a platy layer giving plowed soil a grey colour" (Alberta Department of Agriculture 1976:18). These soils have a lower than average content of essential elements such as nitrogen, calcium and sulphur and do not have the high natural fertility and productivity of grassland soils of the prairie and parkland areas of Alberta (U. of A. and Cda. Dept. Agric. 1971:20). As a result, the crops from this area have a lower nutritive value than those grown in other areas of Alberta (U. of A. and Cda. Dept. Agric. 1971:29). Suitable fertilization is necessary and can double the yield in areas where nitrogen and sulphur are deficient (U. of A. and Cda. Dept. Agric. 1971:86). Farm manure and proper crop rotations also help to increase the nutritive value of crops grown in this type of soil. Legumes, which add nitrogen and fibre to the soil, have special value for improving the soil and have "outstanding beneficial effects on Gray Wooded soils" (U. of A. and Cda. Dept. Agric. 1971:46). This may account for the success of farmers who do not employ chemical fertilizers.

There are other problems facing farmers cultivating this type of soil. When it dries out, the Gray Wooded soils often become hard, necessitating a good deal of power and tillage to prepare a satisfactory seed bed (U. of A. and Cda. Dept. Agric. 1971:28). In fact, when it rains after seeding, the water may puddle on the surface and when it dries, severe crusting may result. Small seeded crops (grasses and legumes), and even cereals, may be unable to push up through the crust and re-seeding may be necessary (ibid). Only by following recommended procedures, can a "skillful farmer" farm this type of soil with success and profit (U. of A. and Cda. Dept. Agric. 1971:86).

Climate

"Agriculture in Alberta is carried on very close to minimum climatic conditions" (Alberta Department of Agriculture 1976:6). Yet, while the average climate is generally favourable, the province often experiences frequent extreme fluctuations which makes crop production rather risky. "One of the most important problems in farming the Gray Wooded soils of Alberta is the hazardous nature of the climate" (U. of A. and Cda. Dept. Agric. 1971:28). This is especially true in west central Alberta where the climate, soil, higher altitude, and latitude generally preclude any extensive agricultural development (Dumanski et al 1972:56) and compound the marginality. Climate is limiting to agriculture and is probably the most important factor in this area (Dumanski et al 1972:64).

The climate of the Edson region (Table I) is of a modified continental type characterized by long, cold winters and short, warm summers (Alberta Department of Agriculture 1976:5). It differs from the "typical" prairie climatic regime in that the winters are generally warmer with more snow and the summers are cooler with more rainfall. There are often "wide diversions from average conditions" which undoubtedly affect the agricultural potential of the area (Statistics Branch Alberta Agriculture 1976:5). However, because of the latitude,

TABLE I. AVERAGE TEMPERATURE (°C) AND TOTAL PRECIPITATION (MM) FOR THE EDSON REGION DURING THE GROWING SEASON, 1951-1980.

(Data from Canadian Climate Normals, 1951-1980, Atmospheric Environment Service, Environment Canada. The location of the Edson weather station changed three times during the period 1951-1980.)

Edson Weather Stations 3062240 and 3062241
(53°35′ N, 116°25′ W), 923m a.s.l. and 924m a.s.l.
1951-1969

	April	May	June	July	Aug	Sept	Oct
Average Daily Temp (°C)	3.0	9.0	12.7	15.0	14.0	9.3	3.9
Total Precip (mm)	24.5	67.7	78.9	123.1	77.7	50.4	35.7

Edson A Weather Station 3062244
(53°35′ N, 116°27′ W), 922m a.s.l.
1970-present

	April	May	June	July	Aug	Sept	Oct
Average Daily Temp (°C)	1.9	8.1	11.8	14.4	13.2	8.5	3.1
Total Precip (mm)	26.4	57.4	88.3	89.5	93.7	44.5	28.6

longer summer days make up for the short growing season and help to hasten plant growth (MacEwan and Foran 1968:3). The higher elevation results in cool nights and a shorter frost free period. One third of the year's moisture usually falls during the growing season (May, June and July) (MacEwan and Foran 1968:3). April and May are generally dry months, favouring spring seeding operations (Statistics Branch Alberta Agriculture 1976). However, there is also an increased tendency for wetter spring and fall months which can interfere with seeding and harvesting (Alberta Department of Agriculture 1976:6), and rains in late July and August delay and complicate harvesting (U. of A. and Cda. Dept. Agric. 1971:28). A summary of the average temperature and precipitation for the Edson region is presented in Table I. It is important to note that these averages tend to be misleading because they mask the large range of variability that exists between years.

The frost free period is particularly important to agriculture as it refers to the number of days between the last freezing temperature of spring and the first freezing temperature of fall (Alberta Department of Agriculture 1976:6). Although many crops can survive light frosts without suffering too much damage, a killing frost (28° F or -2° C) causes severe damage. The killing frost free period is usually three to four weeks longer than the regular frost free period. The average decadal frost free period of the Edson region (Table II) was calculated from raw data obtained from Climatology, Environment Canada. The fact that the Edson weather station has been located in three different locations might account for some of the variability seen in this record.

Climate is the "sum total of the weather experienced at a place in the course of a year or over the years" (Roberts and Lansford 1979:18), including descriptions of averages and normals, as well as all extremes and variations. "Weather" is the "prevailing state of the atmosphere as measured on a daily basis", that is, the temperature and precipitation at any given moment (Parry and Carter 1983:1). "Climatic change" is a relatively stable alteration of existing climatic conditions (i.e. long term change) "either in mean values of specific climatic variables (i.e. temperature, precipitation) or in the variability of the variables" (Parry and Carter 1983:1). Finally, "climatic variability" describes the observed year to year differences in climatic variables (ibid), which implies a shorter time scale than does "climatic change". Harding (1982:6) notes that it is "a common misconception that major shifts take a long time to develop, such that one man in his lifetime would hardly notice the difference". It would be fair to say, therefore, that an individual could experience both

TABLE II. INFORMATION ON THE LENGTH OF THE REGULAR FROST FREE PERIOD OF THE EDSON REGION BY DECADE, 1920-1986*.

(* The Frost Free Period is marked by temperatures of 0°C or below. Decadal averages were calculated from raw data provided by Climatology, Environment Canada).

1920s - 63.7 days	Edson Weather Station 3062240 1914-1959
1930s - 64.4 days	"
1940s - 61.7 days	"
1950s - 63.0 days	"
1960s - 72.7 days	Edson Weather Station 3062241 1960-1969
1970s - 65.6 days	Edson Weather Station 3062244 (Edson A Station) 1970-present
1980s - 78.8 days	"

Average Frost Free Period from 1920-1986: 67.1 days.

Longest Frost Free Period: 126 days in 1944.

Shortest Frost Free Period: 3 days in 1934.

Spring Frost: Earliest - May 13, 1944.
Latest - July 14, 1934.

Fall Frost: Earliest - July 16, 1936.
Latest - September 23, 1938.

climatic variability as well as climatic change in their lifetime.

History of the Edson Region

The Edson area has a very recent history. Incorporated in 1911, the town of Edson is a product of westward railway expansion, having been established as a divisional point on the Grand Trunk Railway. This point was originally to have been built at Wolf Creek, eight miles to the east of the present day location of Edson, but a rush of land speculators forced the railway to move at the last minute to the present site of Edson, then an area of muskeg at the location of what was first known as the town of Heatherwood (M. Ahlf p.c.).

The Edson Board of Trade distributed promotional pamphlets in 1915 and in 1929 to lure potential homesteaders to the area. The region was promoted as having good alluvial soil "consisting primarily of a rich mellow clay, entirely free from alkali and practically free from stone" (Edson Board of Trade 1915). The 1915 pamphlet described the region as having "reliable rainfall in the growing season" and in 1929, climate was decribed as comparatively mild because of the "lack of blizzards and severe storms" (Edson Board of Trade 1929). The area was said to be park-like with the occasional swamp and muskeg on a "rolling topography with numerous streams and occasional lake" (Edson Board of Trade 1915) and as having enough spruce and timber to provide material for building (Edson Board of Trade 1929). Earlier it had been described as being "burned over in recent years, the bulk more or less open or covered with light growth ... requiring a certain amount of clearing before the land could be tilled or cultivated" (Edson Board of Trade 1915). The area was said to be suited to mixed farming where grasses and vegetables had a high yield per acre and a high grade of wheat could be produced. J.H.B. Smith, a farmer in nearby Wolf Creek, was declared "World Wheat King" in 1929 (Edson Board of Trade 1929) due to the top quality wheat he produced. His success was used as a major drawing card for the Edson area. "There has never been a crop failure in this district!" exclaimed the 1929 Edson Board of Trade promotional pamphlet in an attempt to lure prospective homesteaders to "the finest farming area west of Edmonton".

As an added attraction to lure settlers to the west, the government passed a Homesteading Act. For a homesteading fee of ten dollars, pioneers could claim 160 acres of land. Providing they lived on the land for at least six months of every year for three years and brought some of the land under cultivation, the land was theirs.

The population of western Canada grew steadily as homesteaders, mainly immigrants, moved westward with the expanding railway (Alberta Department of Agriculture 1977:3). Most early settlers came into the Edson area by horse and wagon from Edmonton, making a rather perilous journey through bush and across rivers (p.c.). A road existed, in theory, in the 1920s, although it was scarcely useable until the 1930s. When the railroad was completed in the 1920s, settlers had the luxury of taking the train as far west as Peers, Wolf Creek, or Edson and continuing by horse drawn wagon to their land claim.

Upon arrival, settlers´ first thoughts were of building a cabin, which was often quickly and haphazardly thrown together. Many a pioneer´s first winter was spent in a tiny 12x14 foot cabin, which was poorly caulked, had a tar paper roof, and newspapers covering the walls. Settlers often lived in these conditions in the company of one or two other newly arrived families, and, until the invention of DDT, in the company of bedbugs. If they were lucky, by the second winter, the homesteaders had made improvements and expansions on the existing cabin which made life more bearable (p.c.).

Much of the area was heavily wooded and a tremendous amount of clearing was necessary. Clearing the land was an ardous job, accomplished through the use of horses, axes, and chains. Often the first crop could not be planted for two or three years after arriving. In the meanwhile, families had to rely on hunting and gathering wild berries for food. Much of the land was rocky due to the nature of the local glacial deposits and the rocks were mainly small and difficult to get rid of because new ones made their way to the surface every time the land was cultivated (p.c.).

During the 1930s, both the Depression and drought conditions over western Canada made life extremely difficult. Many farmers from drought-striken Manitoba, Saskatchewan and southern Alberta packed up and moved to western Alberta where the effects of the drought were not as severe and a mixed farming economy had a greater chance of success. The rise of the Coal Branch mining district, which developed to the southwest of Edson as a result of the need for coal for the railways, was also responsible for the influx of settlers to the area in the early part of the century (M. Ahlf p.c.). Ambitious people tried to take advantage of the government's Homesteading Act by claiming their homestead and, while trying to meet the requirements in order to gain ownership of the land, working on the Coal Branch for cash. A number of pioneer wives were left alone on the farm while their husbands worked on the Coal Branch for most of the year. Often the homestead requirements were not met and the land had to be given up (p.c.). After World War II, oil became the preferred fuel and the mines on the Coal Branch gradually closed down. In the 1940s, those miners who still had land returned to their homestead, only to realize that they were not cut out to be farmers and eventually abandoned the land (p.c.). Local farmers today explain that these people were not, and never were, farmers in the true sense; they were only people who tried to take advantage of "cheap" land and were unable to run a successful farm (p.c.).

Since then, the population of the area has fluctuated, although it has gradually increased. A number of farmers left the area during and after both World Wars and much of the land reverted to bush (p.c.).

Although the area was first promoted as being the home of "Number 1 Wheat" (Edson Board of Trade 1929), it was not suited to grain farming. Many farmers started growing grain upon their arrival, but they were quick to discover that the short growing season did not allow for the maturation of grains and if, by chance, the grain did mature, it was rarely graded No. 1. Many local farmers claim that the award-winning wheat grown in 1929 by J.H.B. Smith was an experimental plot, pampered and heavily fertilized; chances of growing an entire field of No. 1 wheat were extremely slim. Most of the farmers were well aware that this was not an area well suited to grain growing and the major portion of their operation was always given to hay and cattle. Even if they were successful in their endeavours to grow grain, the distance to the nearest grain elevator did not make the prospect worthwhile.

In their first years of farming, when crops were not particularly good or were non-existent, the farmers in the Edson region could always look to the land for survival. Many farmers relied mainly on berries and game for their food supply and would not have survived without it. Today, farmers still count on the land around them to provide additional food throughout the year.

The provincial and federal government agricultural authorities recognize the marginality of the Edson region. In June 1961, they introduced the Agricultural Rehabilitation Development Act (ARDA) in an attempt to improve the economy of Alberta and Canada (Edson Leader January 16, 1964). Farm income in the Edson region had been very low in previous years (ibid). Improvement District 14, the area from Hinton to Whitecourt, was chosen as a pilot area for the project initiated under the new Act. The goal was to promote specialized crops and forage farming and to increase the amount of cleared land available to farmers in appropriate areas. The government wanted to give the farmer the "impetus to farm his land to the best of its productivity" (Edson Leader January 24, 1968), so the program involved such things as land clearing projects, improvement loans and re-education for rural people unsuited to farming "for various reasons" (ibid). The authorities were ready to assist any families who wanted to leave their farms by offering assistance should a family decide to sell. The primary objective was to give farmers a "new approach to the problem of obtaining the land they need to enlarge their farming operation" (ibid).

The Edson Region Today

The farmers of the Edson region have changed their farm strategies over the years. Today, mixed farming is the norm. Barley, oats and forages are the dominant crops with forages being the most common (Dumanski et al 1972:64). A rotation of two to three years of hay followed by two to three years of cereal crop is suitable (U. of A. and Cda. Dept. Agric. 1971:86), with fallowing used for weed control by some farmers. Perhaps two thirds of farmers presently farming in the Edson area believe that chemical fertilizers are beneficial to their operation and the remainder do not subscribe to their use. Yield differences, however, seem to tell the tale. One farmer maintains that when he first used fertilizer in the 1930s his crop increased by four times compared to what he could produce without fertilizer.

Due to the recent history of the area, some of the original homesteaders, or members of their families, are still alive and farming the land they or their parents homesteaded. These farmers have been there since the land was opened up and have experienced technological, cultural, and environmental changes over the last 50-60 years. They represent an invaluable resource, an primary source of information on changing strategies and lifestyles. They have experienced the hardships and rewards of opening up untouched land with their own hands.

CHAPTER IV

FARMERS OF THE EDSON REGION: INDIVIDUAL INTERVIEWS

FARMER A

Farmer A has farmed in the Edson area for over 55 years. He had never lived on a farm before, but had worked on a friend's farm as a boy and enjoyed it. Today he runs a mixed farming operation and, although he has experimented with other types of operations, he maintains that mixed farming is the key to success in the Edson region. Farmer A does not consider the Edson area to be suitable for grain due to both the length of the growing season and the nature of the soil. He generally follows a three or four year rotation of hay and oats and then one year of wheat and barley. Creeping fescue and grass, including timothy, clover, and alfalfa, are his main hay crops and he uses the oats he grows as green feed or grain, whichever the season allows in a particular year. As oats are hard on the land, he seeds them only once every three or four years. He does grow some variety of wheat every year, although he realizes that there is not a good chance of it ripening to grain. Because it serves as a poor straw, he does not seed very much. He usually keeps his own grain for his cattle and sells hay and cattle for income, claiming that he would raise more cattle if he did not sell so much hay.

The key to farming the grey wooded soil of the Edson region is chemical fertilizer, according to Farmer A. He has been using it since about 1934 and has found that he can grow up to four times as much hay when using it as compared to using no fertilizer. He believes that ferilizer does not damage the soil and without it, grain could not be grown at all. Farmer A also incorporates fallowing into his every six or seven years into his farm strategy, as it is good for the land and it helps to control quack grass and improves the crop without the use of fertilizer.

Farmer A planted his first crop of oats and wheat in 1929. Both grains, he says, were very successful and he continued to work up these crops for two or three years in order to prepare the soil for a hay crop. After the third year, he seeded tame hay, which he continued to plow under after cutting every three years. The fourth year, he seeded oats or wheat to revitalize the soil. Any grain that he managed to produce was used as chicken feed; he did not bother selling any of the grain because there was no way of transporting it to the nearest grain elevator some distance away. He has always had a large vegetable garden and has been quite self sufficient throughout his life on the farm.

His original harvesting machinery, which he used from 1929 - 1944, consisted of four horses and a binder that cut the grain and rolled it into sheaves to be left to dry in the stook. The grain was later picked up and hauled to the barn to be threshed. In 1944, he bought a tractor to pull the binder and haul the grain to the barn for threshing, a method he continued to use until the late 1970s. Although it meant hiring an extra hand or two for the harvest, he thinks this strategy was quite thrifty. Threshing grain in the barn leaves the weeds and the weed seeds that were included in the cut grain on the barn floor, rather than out in the field where the seed may germinate and be a nuisance the following year. This method was also useful because he could then use the chaff, straw and the light kernels as feed for the cattle. By cutting wheat the modern way, where it is cut and threshed in the field, not only are the weed seeds redistributed in the field, the straw and light kernels are lost in the field and cannot be used as feed.

Farmer A has been conservative in his machinery purchases and believes that this has definitely contributed to his success. Since beginning to farm, he has purchased only two tractors, one in the 1940s, which he still has and which still runs, and a second-hand tractor which he bought in the 1970s. By minimizing his machinery purchases and maintaining his strategy, Farmer A believes that he has employed the most effective and least costly approach to farming.

Purchasing only what he could afford, Farmer A prides himself in the fact that he never went financially "overboard" with his farming operation (p.c.). The only stress he has ever felt was a result of the debt he incurred when he first acquired the farm. Since that time he has felt no stress from the weather or from the bank. He sees financial problems as being the major problem that farmers must face today. Some farmers buy equipment based on predicted income from production and run into debt when their production does not meet their expectations.

Farmer A feels that the weather is not a major factor in the Edson region, unlike southern Alberta or elsewhere in the prairies. Consequently, farming in his area is not particularly risky "as long as you know what you are doing" (p.c.). In southern Alberta, according to Farmer A, the probability of drought is fairly high and therefore, the risk of a poor year is greater than the risk in west central Alberta where there is a fifty-fifty chance that the weather might present problems.

Farmer A maintains that he has never had a "crop failure" (p.c.). In recalling his successes and poor years of the past, he admits that he remembers few bad years but many good ones. The only total loss he has ever experienced was circa 1955 when a bad early frost resulted in the loss of most of his crop. Other bad frosts include one on July 1-2, about 20 years ago (circa 1965), and one circa 1935, but neither did any substantial damage. Interestingly, he believes that an early frost can often be beneficial in improving the quality of the crop as it becomes hardier, as long as the weather remains good for the fall.

Rainfall extremes and drought have never been a problem to Farmer A. He has "never been dried out" (p.c.), even in the 1930s, the summers were not particularly dry. One of his worst years was in 1954 when it rained all summer and, as a result, he had to cut hay in October. The crop was frozen and had to be cut into small stacks and hauled frozen into the barn. As a result, a lot of grain was lost.

Difficult years are not easily remembered, since Farmer A tends to concentrate on the present and on the good years of the past. The key to surviving such difficult years is to "make sure you have a carry over" (i.e. a store of grain, feed and preserved fruits and vegetables) (p.c.) from the year before, a practice that Farmer A follows every year. This acts as insurance in case of a subsequent poor year. For example, in 1984, despite a heavy hail storm which damaged much of his crop and resulted in little grain production, he was able to carry on because of his carry over supply.

Farmer A does not believe there are any trends in the weather. He sees weather as remaining "average" (p.c.) through the years, i.e. that the weather has a basic average and there are always extremes on either side of this average. He claims that the winters are not colder; people think they are because they now have warm houses and clothes, and enjoy the use of cars and other conveniences. In fact, says Farmer A, the idea that it is getting colder is purely psychological.

He has, however, noticed some changes in the weather over the years. For example, he remembers the January chinooks in the 1930s and 1940s, which have not occurred since then. He has also noticed an increase in the amount of wind, which he credits to the growth of the logging industry and the clearing of the land.

He does not consider the Edson region to be marginal in terms of farming potential; it just presents more challenges than other areas. He says:

> "You have to be a good farmer to make a go of it in this area. You have to know the land and the soil and be flexible when the weather changes. You have to take the bad with the good."

He maintains that it is good and productive land if "you know what to do with it" (p.c.). Farmer A has a very positive attitude about farming in the Edson area. He maintains that competent farmers can make a living there without much stress; the only criteria are that "you must know the land and the soil" and not accumulate debts and "get in over your head" (p.c.). He is particularly proud of the fact that he has never had to work off the farm. Those farmers that have had to take work off the farm are not "real" farmers, according to Farmer A, because a true farmer makes his living strictly on the farm.

What would it take to make Farmer A give up farming? Nothing:

> "Even if you're half starved, farming is in your blood and you stay on your homestead. Farming is born in you".

Concerning changing climate and the weather factor, he explains that a good farmer is always ready for it.

> "Farming don't come tailor made! If it was always nice, farming would be boring; it needs to be variable."

He says it is natural to have to worry about the weather; however, it is not natural to worry about money, government and prices. He firmly believes that he can handle anything the weather throws at him. He would never give up because it is the lifestyle of farm life that has kept him there through the years and he has no intention of giving it up now. He maintains that if you want to be rich, "don't take up farming" (p.c.), but if you want a pleasant and comfortable lifestyle, a life on the farm is what you need.

Farmer A farms, not to make money, but to live the type of lifestyle that life on the farm offers. If he wanted to make money, he would have lived and worked in the city. He does not consider farming to be just an occupation; he considers it to be a way of life. It is:

> "being your own boss and running things your way and being responsible for your own success. It is being outside, doing physical work and doing things for yourself."

FARMER B

Experimenting with different crop varieties, fertilizer types, and application sequences is a source of enjoyment for Farmer B. He has been farming in the Edson region since the late 1950s when he took over from his father who had homesteaded the farm on that same site 30 years previously.

Farmer B runs a mixed farming operation today, although it is rather different from that of other farmers in the region. His primary concern is with grains, barley in particular. He generally grows a substantial barley crop along with one variety of wheat and one variety of oats each year, despite the fact that normally, neither grain ripens. Hay is grown and pasture land maintained for his cattle.

Timothy, fescue, red clover, and alfalfa are grown for hay, which is usually all used for his own cattle which are a sideline to his barley. The barley that he does not use himself is sold locally as feed barley. In the past years, he has gradually decreased the number of cattle with the intention of getting rid of them all, but has recently increased the number in order to experiment with intensive pasture management. Almost every aspect of his farm operation involves experimentation; he is always trying to improve on the year before and achieve the best results, under varying conditions. Which crop rotation works the best, which variety matures the earliest, how much fertilizer is most effective, and when should it be applied for best results are some of the questions he pursues.

Each year, Farmer B experiments with a number of different crop varieties. He normally seeds 300 acres to grain and the rest to hay (two crops). In 1986, for example, he tried six different varieties of barley on four acres of land each, along with one new variety of oats and one of wheat. In his experiments with intensive pasture management, Farmer B's goal is to feed the maximum number of cows on the smallest amount of land. He applies different amounts of fertilizer at different times during the year in various fields to see which program is the most effective and cost efficient. For example, in one pasture he might apply a lot of fertilizer in the spring and in the next field he might apply it at intervals throughout the summer, a strategy which he has found to be the most effective. This experimentation with intensive pasture management strategy is the only reason he keeps as many cattle as he does.

He prides himself in the fact that he produces excellent quality barley. He once sent a sample in for evaluation and, in protein, it rated as high as "any barley grown west of Edmonton" (p.c.). He chops up the barley straw and feeds it back to the soil to help revitalize it. He really enjoys using machinery, and has increased the amount of grain he seeds and plans to decrease the number of cattle on the farm so he can spend more time on the grains working with machinery.

Farmer B believes that fertilizer is effective in increasing production but does not recommend using a lot of it. He does not think that fertilizer harms the land; in fact, it increases the yield significantly. When he first started farming on his own, he aimed for yields of what would be considered a good harvest, about 50 bushels per acre of barley. Today due to better fertilizer, management techniques and earlier ripening varieties, he aims for 100 bushels per acre (although he rarely gets it). The amount of fertilizer he uses depends on barley prices. Because of low barley prices in 1986, he will use less fertilizer in 1987. Farmer B sometimes "half" fallows (p.c.); that is to say, he cuts the hay and turns the stubble in June and leaves it for the rest of the season, in order to improve soil quality.

Prior to about 1977, Farmer B followed a rotation of two years of grain and three years of hay. However, in the last ten years (1977-1987) he has been continuously cropping grain, all the while using fertilizer, because the grain was worth more money. At the same time, he has been continuously cropping hay off other land.

Farmer B does not consider the Edson region to be "marginal" in any way. "There is no poor land, only poor farmers" (p.c.). He admits that there is a certain amount of risk involved in farming in this area, but is quick to point out that there is a certain amount of risk in farming in other parts of Alberta as well. In the Edson area, he explains, the risk lies in the shortness of the growing season and the farmer must be smart to get everything to work out properly. If it rains or there is an early frost, it can throw things off and a good farmer has to know how to deal with it. In southern Alberta, however, they tend to have a prevalence of drought which can ruin a whole year of crops. In the Edson region, if things do not work out one year, the weather does not wipe out all resources. There is always something to fall back on: cattle, the garden, and the wildlife resources of the area, including fish, game and berries, to pull him through until the next year. In southern and eastern Alberta, however, if they suffer drought conditions, everything is affected. Due to the prairie type of vegetation, there is no "natural garden" (p.c.) to fall back on. Those areas lack the natural backup system, in case of crop failure, that the Edson region enjoys in the boreal forest. The risk is less in west central Alberta, therefore, than in the south or the east, where the farmers can manage three crops of hay a year in a good year, but none at all in a bad one, and where there is no backup system on which to fall back.

The real challenge to the Edson area farmers is to get the crop in before the first killing frost of fall. The key to farming in the Edson region is to know the soil and know how to work it. He maintains that a good farmer can grow as good a crop here as anywhere with the right treatment. If a farmer knows how to work the soil with legumes and fertilizer and to put the straw back into the land to keep the soil productive, he will succeed.

Farmer B acknowledges that the length of the growing season is short and variable, and to be successful in the area, "you must know the seasons" (i.e. have a feeling for the seasonal changes) (p.c.). A farmer has to be able to seed and harvest quickly, at the right time and "beat the season" (p.c.), in the sense of getting his first harvest in before the first major frosts (in a sense, beating Mother Nature). This is where highly technical equipment becomes useful, as it allows for maximum speed in seeding and harvesting. This is the main reason Farmer B is constantly upgrading his machinery - getting larger, more efficient machines as they become available. He sees it as gaining a larger and larger advantage over nature and enables him to beat the season with greater frequency. It also decreases the risk of not getting his crops off before the first killing frost of fall.

Other strategies in getting a crop off quickly involve good management techniques, such as turning the cut hay frequently so it dries more quickly and can be baled sooner. It must dry as quickly as possible due to the shortness of the season, and getting a crop in and out in the shortest time possible is a challenge he enjoys. Often that means combining as soon as the crop dries from the morning dew (around noon) until, on occasion, 2 a.m. If he knows a crop will not make grain, he has a forage harvester ready to make hay.

To be successful in the area, a farmer also has to be an astute observer of nature and the signs which indicate when to seed and when to harvest. In spring he should know that seeding time is when it is dry and the leaves come out. If a farmer seeds too early, the seed will not germinate and will rot in the ground. In the fall, the crops should be off the field by the time the leaves are off the trees.

Farmer B does not consider farming in the Edson area to be stressful at all. He feels there is no use in worrying about things. "You take things as they go, day by day" (p.c.). The only thing he used to worry about was hail, but he took out hail insurance. After suffering losses to hail three times, he has broken even, the insurance fees offsetting his payments due to crop losses. It costs him sixty to seventy dollars per acre to put in a crop, and he wants to protect that investment and reduce his worry.

Of all the variables he must consider in planning his strategy, Farmer B does not see the weather as a major factor. He is optimistic because "there are always ten dry days in September to get the crop off" (p.c.), but he needs to be ready to move because he never knows when those ten days will come. The weather of the past year in no way affects the way in which Farmer B plans for the upcoming year. If he gets a lot of rain during harvest time, he always knows that it is going to stop. "You have to be optimistic!" (p.c.).

The length of the growing season has remained about the same over the period he has farmed. Some years, he admits, are shorter than others, but on the average, they are about the same, with approximately 49 frost free days in the growing season. He has noticed a shift, however, for the growing season used to run from early April to August, whereas today it runs from May until September. In the 1940s, he remembers his father working in the fields by April and the freeze occurring earlier in the fall. Today, he usually starts seeding by the 15th of May, and is finished by May 24th. Often there is a frost in June, but it is usually light and does no real damage. He says he has never lost a crop to a late frost. Regardless of this shift, Farmer B believes that there are still the same wet and dry cycles during the year.

Farmer B does not think that the winters are getting warmer; people only think that the winters used to be colder because there was less insulation in the houses, clothes were not as warm, and heating was not as efficient. He does not expect the weather to change in the future either unless the "Greenhouse Effect" becomes reality.

Farmer B has never had a failure and does not remember specific best and worst years. He remembers years when conditions were not optimal, but everything always turned out all right. A good farmer makes do regardless of what might happen. For example, in 1944 his father seeded April 8th and it snowed May 8th, but it turned out all right in the end. In 1962, he could not get the entire crop off before the snow fell because of poor equipment; he could not beat the season. The remainder was harvested in the spring of 1963. In 1961, on the other hand, he was able to get the crop off early because the season was long enough. "You take things as they come" (p.c.).

The only negative thing that Farmer B had to say about his experience with farming was regarding the ARDA program in the early 1960s. He describes this as a program in which the government wanted people to retire and move closer to the communities. They also wanted to buy out marginal farms if the farmers would agree. Loans were offered to farmers for which they would pay no interest until they were into production. Many farmers bought equipment in anticipation of getting a loan, but for many, the money never came through. Farmer B maintains that there was a lot of media propaganda about how the government was helping out the farmers, but in reality, they did practically nothing, and, in some cases, made things a lot worse.

C. FARMER C

In circa 1950, Farmer C joined his father on the farm. His father chose to buy land in the area because of nearby relatives. Neither Farmer C nor his father had any experience with farming before this.

Farmer C's father had bought some partially cleared land five years previously, but when they first started to farm it, they found the fields were worn out. The previous farmer had harvested grain too long without returning the land to fallow and hay. As a result, Farmer

C and his father had to work hard to bring the land up to a suitable level of fertility.

At first, the operation was mainly geared towards wheat and other grains, but timothy, clover, and alfalfa hay was also grown for their cattle. A three year rotation of grain and then one year hay was followed. From 1950-1977, they grew barley, oats, and garnet wheat, an early ripening variety that produced weak straw. Most of the time they were able to grow grain with an excellent yield. This would be shipped to the nearest elevator for sale as seed wheat.

After Farmer C took over the farm full time, he developed a mixed operation, decreasing the amount of wheat and increasing hay and pasture land as his cattle herd expanded. He continues to grow timothy, clover, and alfalfa for hay and, although he uses most of it, he sometimes sells hay when the prices are good and hay is in demand. Some wheat is still grown, but every three years he grows oats to bale and use as feed. He recently stopped growing oats, however, because he cannot afford to replace his harvest machinery. He no longer grows barley because it does not have much straw value and cattle need a lot of straw.

Farmer C recognizes that good soil management is important in the Edson region. He advocates the use of fertilizer, as he can double the amount of hay when using fertilizer. He does not believe that fertilizer damages the soil at all. Plowing under the hay also increases yields considerably. As a third measure, Farmer C "half" fallows the land (p.c.), plowing the field under in July after the hay has been cut, to help build up nitrogen. He believes half fallowing in this way makes a difference and so he does it whenever it is needed.

When asked if he feels any stress farming today, Farmer C dichotomized stress into two parts: that which results from financial problems, and that caused by the weather. He says he feels no stress at all from the weather. "You take it as it comes" and do not worry about bad weather until it happens (p.c.). With regard to financial matters, when market prices dip too low for a profit, farming can be stressful. When hay and grain prices are down, he holds a lot over until the next year, in the hope that the prices will go up. As a safeguard against declining cattle prices, he has taken out cattle insurance where the farmer pays one third, the provincial government pays one third and the federal government pays one third. He believes that this lowers the stress he would otherwise feel about market prices, which are his main source of worry and stress. In general, however, stress can be avoided as long as he stays out of debt. The trouble today, he explains, is that farmers tend to get themselves in too deep financially and cannot dig themselves out.

He believes that the weather has changed since he started farming. The rainfall now comes at different times during the year than in the past. It used to rain in April or May but now it comes in June or later. For example, in 1986, they received their "spring" rain in July. He remembers only a couple of dry years since 1950 but they were of no consequence to his farming.

Serious hail occurred once on his farm in about 1962 and it flattened their wheat crop. Since it could not be salvaged, they let the cattle in to feed. Luckily, they had a "holdover" (p.c.) of feed from the year before, so they were able to make it through to the next year. Farmer C makes a habit of holding some feed over to the next year in case it is needed in an emergency.

Farmer C remembers a few early frosts, but only one stands out. In about 1972, the crops froze on July 12 but he managed to pull through. In general, he does not consider frost, early or late, to be a major problem, as it has little effect. He can plant wheat early because it can withstand late spring frosts and will even germinate following a frost. Often it makes the crop even better and "you get better and more seed" (p.c.). Oats and barley, on the other hand, must be seeded in mid May because they cannot handle the frost.

Farmer C believes that the climate is getting warmer, particularly the winters. This makes the summers seem longer, but he admits that he is not sure if they really are. As a result, he thinks the growing season seems to be getting a little longer.

His general attitude towards the weather is one of optimism. In 1986, for example, it rained throughout the month of July and he was unable to cut the hay. But because he knew the rain had to stop sometime, he was not worried. He managed to cut the hay by August 1st, which was rather late, but he had a record crop that year. However, there was a good hay crop everywhere and so he held over some of the hay until the following year, hoping to be able to sell it for a better price. When he has a bad year, what he cannot use as feed he uses as bedding, so he can always use everything, regardless.

Farmer C is constantly upgrading his machinery. He continues to buy newer, bigger plows because they necessitate fewer trips on the field. At the present time, he has twelve plows, ranging in size from small to large. He has two rakes, in case one breaks down, and numerous old tractors that still run, all part of a back up system. Of his three balers, one makes round bales, one square bales and one ´bread loaf´ stacks. He prefers the latter because the cattle seem to like the flavour and they retain moisture better than the round bales. Unfortunately, these bread loaf bales tend to blow away in strong wind. Square bales cost more money and require more people to produce, while the round bales need a larger tractor and fewer people, balancing out the overall costs. He thinks the concept of using more power is a good one.

He believes that there is no real risk involved in farming in the Edson region. Here, there are lots of backup resources: fish and game, berries, and the garden; if he has a bad year, he can still get by. A bad grain crop can still be used as feed. He believes that farming in west central Alberta is much less of a risk than farming in southern Alberta, where they put all of their money into one thing, grains. If southern Alberta farmers have a bad year, which has happened a lot lately, they have no backup system whatsoever because they lack the boreal forest environment and the resources available there. In 1985, he shipped hay to southern Alberta because they had had such a bad year, whereas in west central Alberta, everything had gone quite well. A sufficient amount of good quality cleared land is needed in the Edson region in order to make enough money to keep your operation going. Farmer C explains that in this area, you see generally smaller fields and, because it is so expensive to clear land and prepare the soil, you must use a different strategy than in the south. But, as long as you have enough land, you can survive. Although the land is more suited to forage, it is very productive when treated properly.

Overall, Farmer C does not remember any really good or bad years, although 1985 and 1986 were both record years for hay. He maintains that you must take the weather as it comes and deal with it as it changes. He believes that the area is not marginal and as long as you know the soil, you can succeed. He feels no particular stress, as his debts are paid off. He is proud to say: "I have never worked a day in my life!"

D. FARMER D

Farmer D has been farming, initially with his father, since 1930. They had been running a dairy operation on the Coal Branch, and when the Coal Branch closed down during the onset of the Depression, his father decided to move north and homestead. Using axes, horses and chains they cleared 100 acres themselves. Farmer D explains that this was mainly forested country and that clearing three, four or five acres per summer was considered to be good. The first bulldozer, brought in in 1947, eased land clearing after that.

Initially, they grew wheat and oats, which, Farmer D says, he cannot do today. Today, Farmer D concentrates his operation on hay, pasture, cows and horses. "You can't grow grain here anymore", he maintains, "because it either freezes or doesn´t mature". In the early years, he could grow a good oat crop, and could buy seed oats from his neighbour. Today, because they will not mature here, he has to go as far away as Stony Plain to buy seed oats.

Farmer D feels that chemical fertilizer is "poison" and ruins the soil; if it does not rain, you lose your fertilizer anyway, wasting your money. He does use manure on his fields, which he believes is putting good, natural things back into the soil, replacing what he takes out. His strategy to improve fertility employs field rotation, plowing under hay, and using manure which he applies when necessary to those fields in need. These steps keep the soil in good shape, ensuring success in farming in this area. Proof lies in the increased yields Farmer D has produced without using chemical fertilizers.

Although Farmer D bought his first tractor in the late 1940s, he has never been convinced of its benefits:

> "We were better off when we farmed with horses. It was slower, but you didn´t have that big expense. Everybody seemed to be more happy.... Machinery was supposed to make man an easy life and it did in one way, but it made him a slave to pay for it."

The fact that machinery costs too much, and is too expensive to maintain, he feels, can ruin a farmer. Just running the machines with expensive fuel can put a farmer "under" (p.c.).

Farmer D considers the financial aspect of farming to be the most detrimental factor in running a successful farming operation. Low market prices do not make farming a worthwhile venture. Years ago when bread cost sixteen cents a loaf, the farmer got six cents. Today, the farmer only gets seven cents per loaf; the increased price of consumer goods is not a reflection of the price paid to farmers.

> "No wonder the farmers are going broke! Who would want to farm with the prices so low?"

It costs too much to start up and there is no money to be made to keep the operation going. Low market prices are the main reason young people do not want to go into farming, says Farmer D.

When asked about the stresses of farming, Farmer D says that there is no stress, aside from worrying about the prices, over which he no control. He acknowledges that the weather is changing but this generates no stress as there is nothing he can do about it. He just lives from day to day.

Concerning the amount of risk involved in farming the Edson area, Farmer D says there is a certain type of risk involved. He admits that the area is marginal because it is "on the fringe" of the area to the east which is better suited to farming. The growing season is short, so he has to rush to get his crop in and out of the fields. Compared with southern Alberta, where all they have to contend with is drought and bugs, he feels farming here is more of a risk. This is because of the larger number of variables in the weather, such as frost, excess rainfall, drought or hail, which is compounded by the soil conditions. One advantage, however, is that the Edson region has lots of resources to fall back on in the event of a bad year. By running a mixed farming operation, he always has different aspects of his operation to rely on if one part of it fails. More importantly, he also has the forest to turn to as well. He can always hunt, fish, or collect berries to see him through a bad year.

Farmer D insists that the weather has changed considerably since he started farming. The winters are definitely much warmer, while the summers, especially over the last 10 years, are cooler. In recent years, there has been very little snow; the result has been winterkill, which has reduced the berry crop over the last few years. The longer and warmer summers of the past resulted in better conditions for grain growing. He feels that rainfall is not as abundant today as in the past. Farmer D remembers a weather pattern of seven years wet and seven years dry. This dominant "cycle" continues even though the weather has changed. He also has noted fewer thunderstorms than in the past. During the night, they used to get very bad storms from the south or south-west. He recounts stories of visiting "the flats" (an open field area in the middle of the forest) where he could see the crisscrossed lines in the soil and split trees where lightning had struck. Today, he can no longer see those signs and this verifies his belief that things are changing.

The dominant wind direction has also changed over the past 8-10 years, from the south to the north. This he blames on the increased logging in the area. Since this is tree country, he feels removing the trees changes the wind, as well as the environment, such as the lack of the once abundant horseflies.

When asked about the good and bad years, the events he remembers are often associated with specific family events. The very dry 1930s saw sloughs dry up and considerable difficulties. But there was nothing he could do about it but stick it out; there was never any thought of giving up. There were also dry cycles in the late 1940s, and around 1967 which he managed to get through without too many problems. The only year he has ever had real problems was in 1985 when he lost a lot of hay to grasshoppers.

The main adversary to farming in the Edson region is the government, Farmer D maintains. They are too concerned with "the big outfits" and not with the "little working man" (p.c.). The worst thing that they ever did was to instigate the ARDA program. The government bought out farms of people who were about to retire and moved the occupants to local towns and then planted trees on the abandoned land; they wanted to move everyone out of the country and re-forest the area. Farmer D feels that this was a waste of time and money; it was not good for anyone.

Farmer D says that no matter how tough things get, he makes it through. Although he has had hard, lean years, he does not dwell on them. But he admits that he could not survive on the farm if he did not work off the farm as he has almost always done. Still, he would never dream of giving up farming. A farmer:

> "... is like a prizefighter in the ring. If he´s got his heart on winning, he´s going to hammer in there till he wins or he gets beat; one or the other. It´s the same with farming...".

It is the farming life that he likes the best and that is why he intends to stay on, no matter what.

E. FARMER E

Farmer E moved to the Edson region with her family in 1926. When she first arrived as a young girl, the family had to clear the land themselves. Their first crop consisted of oats, wheat and barley and after a few years, they seeded hay. In those years, she credits the forest for providing much of their food. She often went fishing and hunting for deer, moose, and rabbits and canned much of the meat and preserved the fruit that had been gathered. In those early days, they did not grow enough grain to make it worthwhile to ship it to the local elevator, so they used it all themselves or sold it locally. There was never enough cleared land in the area to make it a worthwhile grain growing region, so it was not worth building a grain elevator. She has always had cattle and a few sheep.

According to her, there has been a decline in the amount of wheat grown in the region. She does not see this as an effect of the weather, but that most farmers were more interested in increasing their herds and therefore grew more feed (oats, barley, and hay).

During the 1930s, burning brush to clear the land was widespread, however, this tended to start a lot of wild brush fires. Besides being a good preparation for the soil, it promoted the growth of blueberries, another food source. Since that time, forestry officials have banned burning and one noticeable result has been fewer blueberries.

Today, Farmer E and her husband grow hay, oats as green feed, and raise cattle and a few sheep. They no longer grow any wheat, because it is too hard on the land and they can grow a much better crop of oats and barley which they need for feed, along with hay. They never grow enough hay and have to buy additional amounts.

To her, soil is the one factor that can make farming difficult in the area. They first started using fertilizer on the farm in 1940. Before its use, the hay was so thin that they could not tell where it had been cut. After using fertilizer, they discovered that it made a big difference to both grains and hay crops. In fact, timothy and clover grew "as high as the horses' thighs" (p.c.). In the 1930s, before they stated using fertilizer, they could grow about 8 bushels of grain per acre, but with fertilizer, they grew up to 30 bushels per acre and found that it produced a better straw. The cost of the fertilizer has been the only deterrent. Although it results in a much better crop, the market price of the grain or hay has to be high enough to make the fertilizer a practical investment. She believes that the use of fertilizer actually improves the soil and allows the soil to be worked more efficiently. Besides using fertilizer and fallow as necessary, you can grow hay and plow it under.

Farmer E personally feels no particular stress in farming. She must just "take it as it comes". She recognizes that the main stress any farmer feels is due to debt and that many farmers get in over their heads. Rising interest rates compound the stress felt from the declining grain and hay prices, and there is nothing a farmer can do about it. She blames financial problems, not changing environmental factors, for the majority of farms that are abandoned. Most farmers go under because they buy too much land, thinking, of course, that they can make lots of money. They try to get bigger and bigger until they finally overdo it and everything falls through because of debt.

As far as the weather is concerned, she feels it causes them no stress whatsoever. "You just take things as they come" (p.c.). Worrying about it will not help because you cannot control the weather or change it.

In terms of risk, Farmer E does not think that farming in the Edson region is particularly risky. She does believe, however, that farming in southern Alberta is particularly risky because of the farmers' dependency on grains and there is a high risk of losing everything if the weather is bad. In the Edson area, if one part of your operation fails, you always have something else to fall back on. If worse comes to worst, you can always turn to the woods for food in the same way that her family did when they first homesteaded. Southern Alberta lacks those resources and the farmers suffer greatly when the crops fail. In the Edson area, there is plenty of game and fruit to gather and a farmer, in a bad year, would have no problem gathering enough food in the woods to pull them through.

Farmer E perceives that temperatures, generally, are getting warmer. As a result, the growing season is getting longer and this fact, along with changing crop varieties, means that the grains they grow stand a better chance of maturing. She does not believe that the weather increases the risk of farming in the area anymore than it does anywhere else in Alberta.

Farmer E does not remember any particularly good or bad years for weather or crops. In terms of crop yields, "I think they come up better some years than others." There were no ´best´ years, she maintains; they were all pretty good. When asked about bad years, she remembered several "problem" years (p.c.). In the 1930s, there were a series of years when they received no rain in June (around 1937), and as a result, for four years, they had poor crops. They never thought of giving up, because they had nowhere else to go, and in this area, they were able to hunt and fish and there was always lots of firewood. Even though it was dry here at that time, she recalls a lot of people moving here from further east because of the drought on the prairies. Obviously, these new people thought that farming in the Edson area would be less risky than on the prairies where they grew mainly wheat and had no backup subsistence system if the crop failed.

In Farmer E´s recollection, 1935 was probably the worst year they have ever had. She remembers a foot of snow on May first and a heavy frost on August 14th which froze all the crops. As a result, they had no seed or grain and had to find some way to pull through until the next year. The garden froze and the potatoes were extremely small and had to be eaten with their skins on because "there was not much else to them" (p.c.). A frost happened in August, 1986, but, according to Farmer E, she just tried again the next year. It is her observation that if you get by without a frost on the full moon in August, then you can usually be assured that there will be no frost until the full moon in September. A good farmer should use that time to get as much done as possible.

She also remembers a definite increase in rainfall after World War II with floods in 1944, 1954, 1969 and 1980. Since the weather can be so variable, it really does not affect the way they plan their next year's farming strategy. "You never know what might happen so you take it as it comes" (p.c.).

In 1948, Farmer E and her husband decided to try their hand at potatoes and bought a row crop tractor. Their peak year for potatoes was 1948, but the prices were not good and it was a very labour intensive operation, so after a few years they stopped growing potatoes on a large scale, only planting them in the garden for their own use.

The reason they have stayed on the farm all these years is because they like the lifestyle. They have always had to work off the farm, however, to be able to keep the farm running. But, this is what they have done all their lives and they have never had any intention of leaving.

She figures that there will be a decline in farming in the Edson area in the future because none of the children of farmers want to take over their parents´ farm. They all move to town or to Edmonton. Only in a few cases have several generations remained on the same farm. She also blames the decrease in farming in the area on the increased price of machinery and operating costs. Because of the cost, they never purchased much machinery, only what they needed to get by. She remarked that she knows of a few farmers who have bought machinery in groups, due to the cost.

F. FARMER F

Farmer F moved to the Edson region in the late 1940s with his family. They arrived in the spring, bought two quarters of partially cleared land, and worked on clearing the remainder over the next few years. The land that was already cleared when they arrived had to be re-cultivated the first summer, in order to prepare it for seeding the following year. They planted their first wheat crop a year later, producing Number 1 Marquis that first year.

For the first few years, Farmer F´s father ran the farm and Farmer F worked elsewhere. His father grew mainly grains and shipped what he could to the nearest elevator. Cattle and hay were of secondary importance. As his father gradually increased the herd size, he decreased the amount of land he seeded to wheat, replacing

?

it with feed crops.

Farmer F took over the farm in the early 1950s and immediately switched over to pigs and continued with some grain. He all but stopped growing wheat because it was not a good feed for pigs and he did not want to have to take it to the elevator over poor roads. He had also increased the number of cattle and required more feed and less wheat. He increased the amount of oats and barley because these are not nearly as hard on the land as wheat.

Farmer F continued growing grains and raising pigs until about the late 1950s. By then, he had noticed that the weather was becoming wetter and the productivity of his grain crop poorer. At that point, he switched his operation to mainly hay and cattle.

Farmer F has never used a chemical fertilizer, only manure, since he feels that he could always grow enough without its use and it would just be a waste of money. A good farmer should work the stubble into the soil and use manure instead of chemical fertilizer which damages the soil. He cites examples of having seen potatoes that turn black during cooking, the result of the use of chemical fertilizer. Besides, he says that a good farmer should try to run his farm on the least amount of money.

Farmer F sees definite trends in the weather. He believes that the winters are much warmer than they used to be and that this trend will continue. It is generally warmer all year round, largely because the winds come from a different direction today than in the past. He explains that the winds used to come from the north and northwest, through the mountain passes from the Yukon and would bring cold air. Today, the winds come from the west and are warmer, resulting in warmer temperatures all year round.

The weather patterns have changed most noticeably around harvest time. When he first started farming, it used to be as "dry as a bone" (p.c.) from the 24th of May until they made hay. Then, in September, they would get some snow, which would completely cover the stooks, but the snow would dry up two weeks later and it would be beautiful and warm for the next few weeks. They could always get back on the land and continue their threshing. This pattern continued into the late 1960s. But, over the last 20 years, it has been hot at the end of August, nice in early September, with a lot of rain around the equinox. This means that they cannot get back on the land until almost freeze up; as a result, they have not been able to accomplish as much in the fall in recent years as they have in the past.

Farmer F remembers certain years for the weather. The winter of 1947 is remembered for its deep snow and extreme cold. He remembers 1954 because it rained all summer and because of it, he lost several calves. In 1972, they lost their crop due to frost, although it was not a total loss as they were able to use it as feed. He claims, however, that the past year's weather has never affected the way he plans for the coming year because you never know what the weather will be like the following year.

Despite his belief that the climate is getting warmer, Farmer F says that this does not affect the length of the growing season. He says the length of the growing season has remained about the same, although actual crop growth today is not as good as it has been in the past. He blames this on "what's in the air" (p.c.) or the result of numerous gas plants in the area. The gas that spews from wells that are being tested damages the soil, affects the air, and worsens growing conditions. Stories he has heard from other farmers lead him to believe that the gas has a detrimental affect on cattle.

When asked about the sorts of risk he faces farming in the area, Farmer F replied that he could not decide which was the greatest risk: market prices, the government, or the weather. Certainly, he said, the markets provide the greatest uncertainty because they jump around so much and are so unpredictable. He feels the same way about the changing policies of the government and the fluctuating interest rates at the bank. "You have no control over them. They control you and you are at their mercy." (p.c.). As far as the weather is concerned, he sees it as a risk but says that it is just something that he has to live with: "you take it as it comes" (p.c.). He goes on to explain that this is mixed farming country, no longer suited to grains, but the good part is that he always has something to fall back on. If the weather is bad, he always has some way of "getting by" (p.c.). The only way he can really prepare for falling market prices or increasing bank rates is by not borrowing money or getting in too deep. He can counteract the possibility of bad weather by keeping and using everything he grows. His farm has always included a few chickens, turkeys, and pigs, as well as a huge garden and a large cellar for storing produce. They have always canned or preserved everything they could so in the event of a bad year, they still had food to get by on. In this way, they could always cope with bad weather years, making weather less of a risk than falling prices and high bank rates.

When asked about good and bad years, Farmer F said he has never had a year when he did not "get his crop off" (p.c.), even if it hailed or froze, he would just cut it for feed. As he sees it, there never was a total loss because they could always find some alternative. He has never had to leave a crop in the fields all winter, therefore, he can honestly say that he has never had a bad year. Farmer F's main opinion of farming in the Edson area is that "as long as you know what you are doing and you are a good farmer, you can succeed" (p.c.).

CHAPTER V

DISCUSSION OF THE DATA

Edson Area Farmers´ Perception of Climatic Variation

Hare (1985) has proposed a series of idealized climate time-series to describe variation (i.e. change with time) which can be modified and used in representing the Edson area farmers´ perception of climatic variation. These time-series were proposed to describe climatic parameters which are continuous in time, such as air temperature. In order to apply these time-series to climatic variables which are discrete (i.e. not continuous in time), such as rainfall, the average (i.e. monthly rainfall) is used, and, therefore, the discreteness vanishes (Hare 1985:41).

These time-series are described as follows.

Curve I: "shows the short-term variation typical of atmospheric time series". In this sequence, the variation in Curve I "is distributed about a central tendency that changes almost impulsively in a short period of time to a new regime" (Hare 1985:39).

Curve II: "shows a series in which the series is

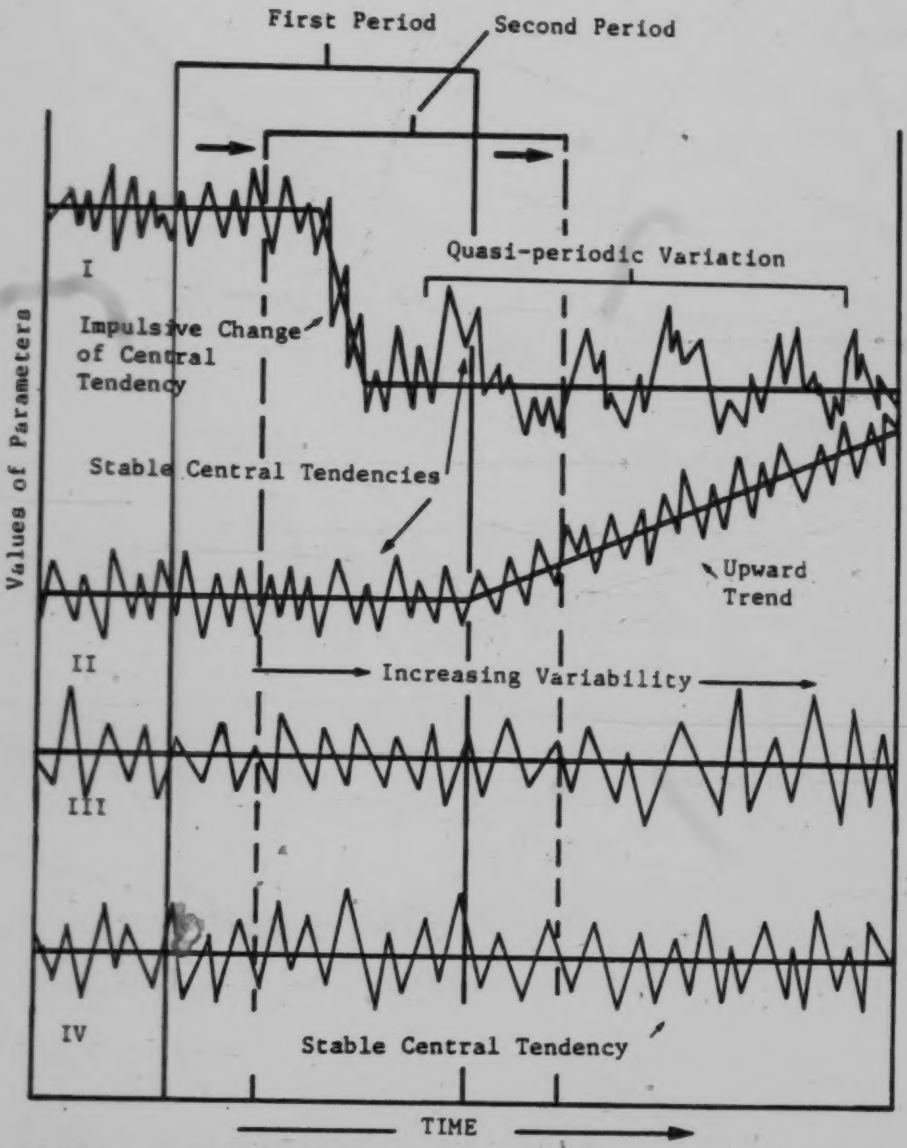

First Period
Second Period
Quasi-periodic Variation
I
Impulsive Change of Central Tendency
Values of Parameters
Stable Central Tendencies
Upward Trend
II
Increasing Variability
III
IV
Stable Central Tendency
TIME

FIGURE 1. IDEALIZED CLIMATE TIME-SERIES.
Curves I-IV represent a parameter of a climatic event that is continuous in time. Vertical bars represent averaging periods (usually 30 years) which are re-calculated each decade. Modified from Hare (1985:40).

stationary with a stable central tendency and then shows an upward trend. "The short-period variations appear unchanged throughout." (Hare 1985:40).

Curve III: displays a constant central tendency, "but short term variations appear to increase in amplitude as time progresses." (Hare 1985:40).

Curve IV: displays a constant central tendency about which the climate varies, but the average remains the same.

The perceptions of the farmers of the Edson area of changing climate are summarized in Table III. When asked if they had noticed any changes in the climate, the individual farmers each gave different answers. Hare's time-series are useful in depicting the Edson area farmers' perceptions of changing climatic patterns through time.

Farmer A believes that the weather, in terms of both temperature and rainfall, has remained "average" over the years (p.c.), but with extremes of cold and warm, wet and dry. Regardless of the extremes, the climate has always returned to "normal" (p.c.). This can be represented by the Curve IV, where there is variation about a constant, stable central tendency. Although extremes may occur on either side of this central tendency, the central tendency, or average, remains normal.

According to Farmer B, the rainfall pattern has

TABLE III. SUMMARY OF INDIVIDUAL FARMERS′ PERCEPTIONS OF CHANGING CLIMATIC VARIABILITY IN THE EDSON REGION.

FARMER	TEMPERATURE	PRECIPITATION	GROWING SEASON	TIME-SERIES CURVES
A	Variation about a Constant Central Tendency	Variation about a Constant Central Tendency	No change	both Curve IV
B	Variation about a Constant Cental Tendency with one month shift in timing	Variation about a Constant Central Tendency - 1 month shift	No change	both Curve IV
C	An Upward Trend in Central Tendency -warmer generally -especially the winters	Variation about a Constant Central Tendency - 2 month shift	Longer	2nd half Curve II & Curve IV
D	Decreasing Variability -summers cooler -winters warmer	Variation in Central Tendency which changes to a new Central Tendency (7 yrs wet and 7 yrs dry) - quasi periodic variation	Not Sure	Decrease Variability III & I
E	An Upward Trend in Central Tendency -warmer generally	Variation about a Constant Central Tendency	Longer	2nd half Curve II & Curve IV
F	An Upward Trend in Central Tendency -warmer generally -especially the winters	Considerable Variation - no cycles - no predictability (Not represented by Hare′s Time-Series)	Longer	2nd half Curve II (rainfall not shown)

remained the same through the years, which can be represented by Curve IV, that is, variation about a constant, central tendency. The temperature pattern, however, has shifted by about one month; warmest temperatures used to run from April to August but now run from May to September. The idea of a stable, central tendency, however, prevails in spite of this shift, and can be represented in the same manner as the rainfall pattern.

Farmer C believes that although the weather, in general, is becoming warmer, the winters are especially warm. Consequently, the growing season is longer than in the past. This can be represented using the second half of Curve II, showing an upward trend in central tendency. He also believes that the rainfall has shifted; it used to rain in April or May and it now rains in June or July. The amounts of rain, however, have remained "average", fluctuating around a constant central tendency.

According to Farmer D, the summers are getting cooler and the winters are warmer, which is a decrease in variability, (as opposed to the increase in variability represented in Curve III). A persistent rainfall cycle of seven years wet and dry has prevailed and can be represented by Hare's "variation about a central tendency", Curve I, in which the central tendency changes impulsively to a new central tendency, with a quasi-periodic variation, in this instance, over a seven year period.

Farmer E believes, as does Farmer C, that the weather in general, has become warmer. This is represented as a gradual upward shift in the central tendency, as in the second half of Curve II. As a result, the growing season is longer than in previous years. She, along with Farmers A and B, has noticed no real change in rainfall patterns (Curve IV).

Farmer F concurs with Farmer C that the winters are warmer, and, in general, the yearly temperatures are becoming warmer, represented as an upward trend in central tendency (the second half of Curve II). He sees considerable variation in rainfall, but notes no cycles or predictability (not represented by climate time-series).

Specific years that the farmers could recall were usually those years earmarked by special events that coincided with a weather extreme, for example, weddings, dances or births. In most cases, the informants could only remember one or two extreme events: those being the coldest, the hottest, the earliest or the latest frost, or the wettest or driest years. It seems likely that other years, when compared to extreme years, do not seem quite so bad. Whyte (1985:408) points out that past impacts tend to affect the way new ones are perceived. In a study of Mexican peasant farmers, Kirkby ([now known as Whyte]

1973) found that more extreme recent events tended to blot out the memory of earlier, less extreme events and these acted as a reference point against which other events were compared. This seems to be the case in the Edson area, where two of the Edson area farmers made the comment that all of their farming years have been good, perhaps implicating a psychological factor where they tend to remember good years more than bad ones (Carter and Parry 1983:2). This is, perhaps, part of a survival mechanism which perpetuates their optimistic attitude. In any case, all of the farmers stated that they do not dwell on bad years, that being one way they were able to maintain a positive outlook.

The Climate Record for the Edson Region

The climatic information relevant to the observer-decision maker are not long term averages (climate change) but the evidence of variability, as this is the way in which climate change impacts on society (DeVries 1985:280). It is the variability which sends signals to the individual decision maker (ibid). In order to assess the amount of climate variability for the Edson region, a review of the climatic data is in order.

The mean monthly temperature and the monthly precipitation records for the Edson region were obtained from Environment Canada. From these data, the variation in the monthly mean temperature (Fig. 2) and in the total monthly precipitation (Fig. 3) for the growing season, April through October, from 1979-1980, is evident. It should be noted that these data may not exactly record climate conditions for very local areas, such as individual farms.

Mean Monthly Temperature

Mean monthly temperature variation for April (Fig. 2a) has been considerable, with warmer periods, ca. 1955 - 1975, displaying less variation. In only six years has the April mean been below 0°C. May (Fig. 2b) shows a high amount of variation, but the mean monthly temperature remains between 6.2°C and 11.4°C throughout the period. June (Fig. 2c) maintains a high degree of variability.

July (Fig. 2 d), August (Fig. 2e), and, to some extent September (Fig. 2f) display the same sequence of changing variability. From ca. 1917 - 1942 there appears to be random variability. However, from ca. 1942-1954 there is a decrease in variability for all three months. Variability increases considerably for these months from the late 1950s until 1980.

October (Fig. 2g) displays a high degree of temperature variability throughout the period. With so much variability in April and October, it would be difficult for the farmer to predict when to seed or to

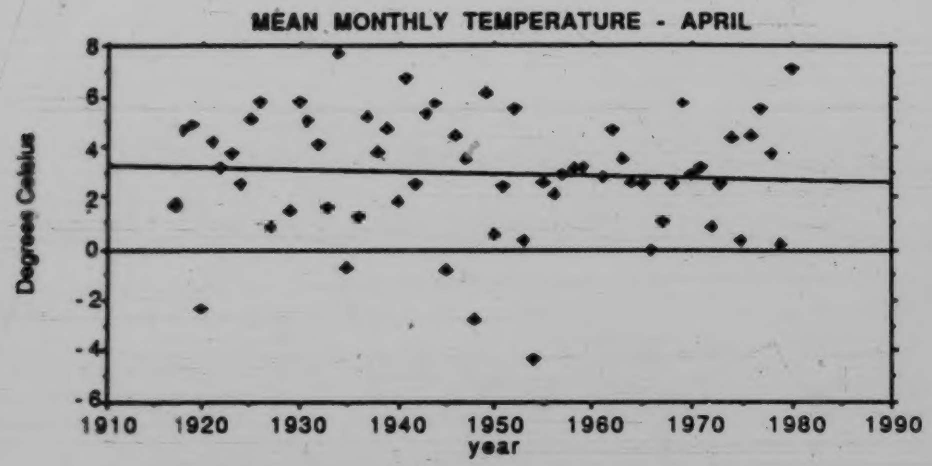


Figure 2a APRIL

Mean Monthly Temperature: 2.969°C
Standard Deviation: 2.43
Minimum Mean Monthly Temperature: -4.4°C
Maximum Mean Monthly Temperature: 7.7°C
Correlation: -.058

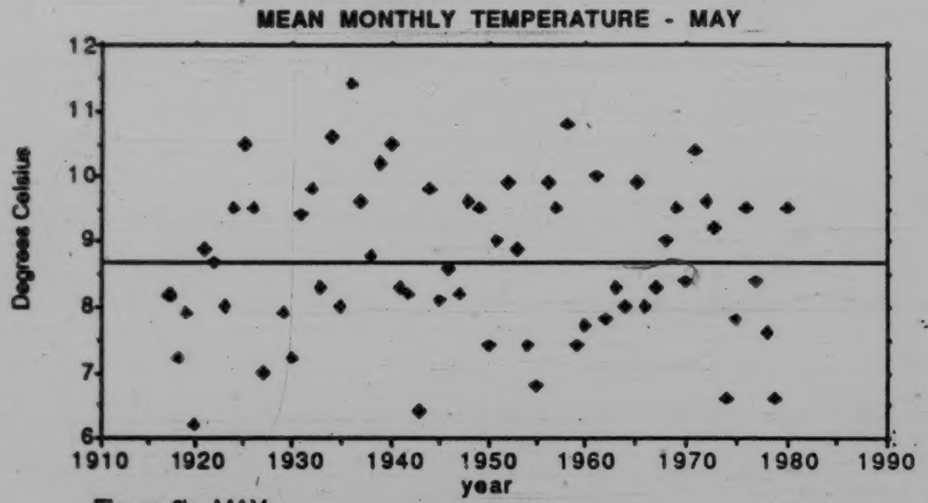


Figure 2b MAY

Mean Monthly Temperature: 8.684°C
Standard Deviation: 1.196
Minimum Mean Monthly Temperature: 6.2°C
Maximum Mean Monthly Temperature: 11.4°C
Correlation: .002776

FIGURE 2. VARIATION IN MEAN MONTHLY TEMPERATURE FOR THE EDSON REGION 1917-1980.
(Data obtained from Climatology, Environment Canada. The line represents the regression line.)

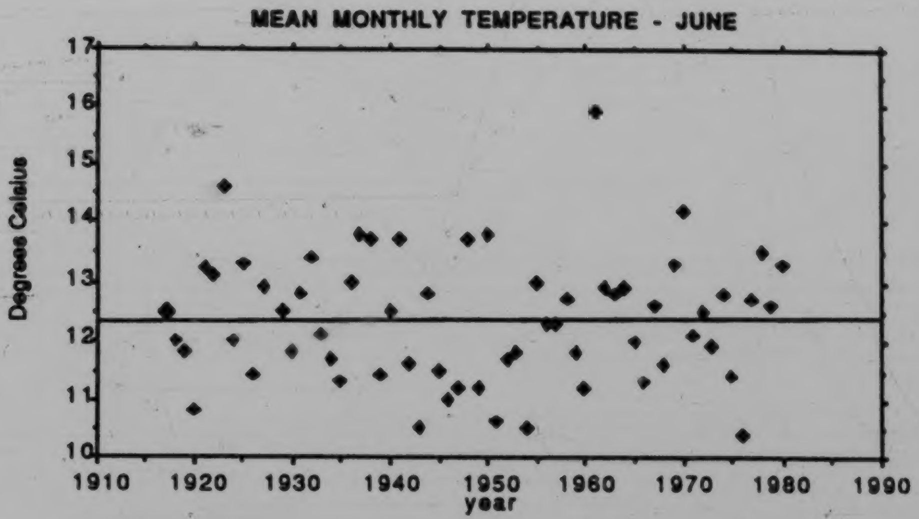


Figure 2c JUNE

Mean Monthly Temperature: 12.368°C
Standard Deviation: 1.075
Minimum Mean Monthly Temperature: 10.4°C
Maximum Mean Monthly Temperature: 15.9°C
Correlation: .01

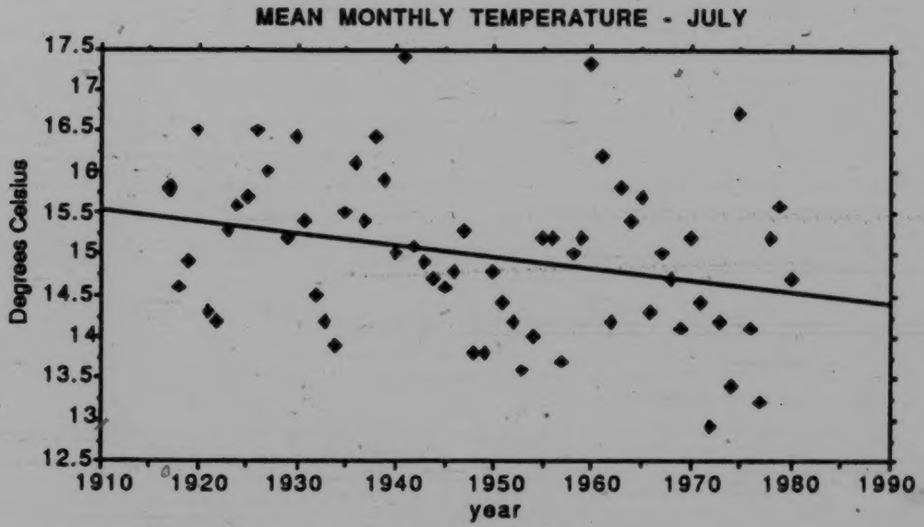


Figure 2d JULY

Mean Monthly Temperature: 15.005°C
Standard Deviation: .962
Minimum Mean Monthly Temperature: 12.9°C
Maximum Mean Monthly Temperature: 17.4°C
Correlation: -.275

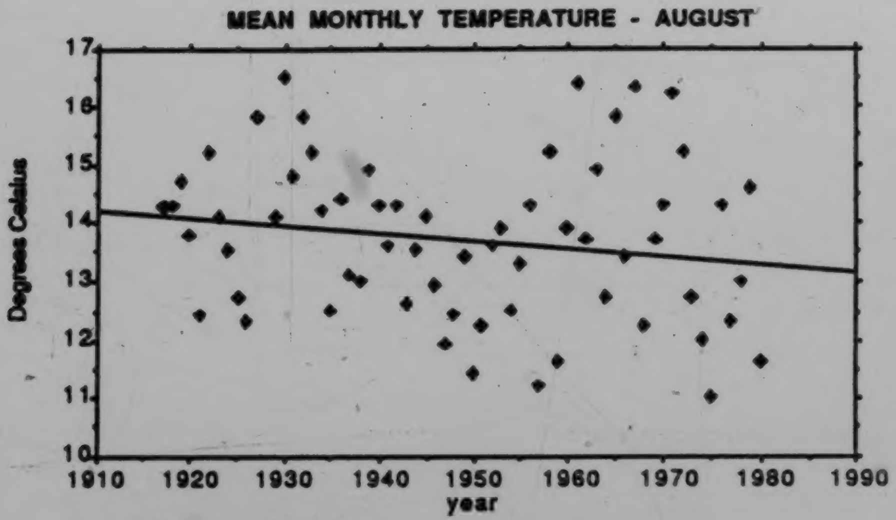


Figure 2e AUGUST

Mean Monthly Temperature: 13.71°C
Standard Deviation: 1.363
Minimum Mean Monthly Temperature: 11°C
Maximum Mean Monthly Temperature: 16.5°C
Correlation: -.173

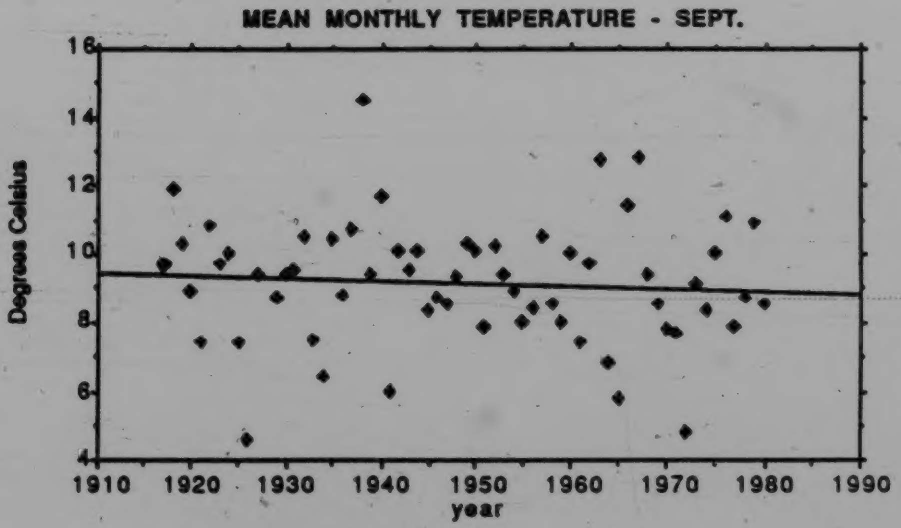


Figure 2f SEPTEMBER
Mean Monthly Temperature: 9.168°C
Standard Deviation: 1.8
Minimum Mean Monthly Temperature: 4.6°C
Maximum Mean Monthly Temperature: 14.5°C
Correlation: -.079

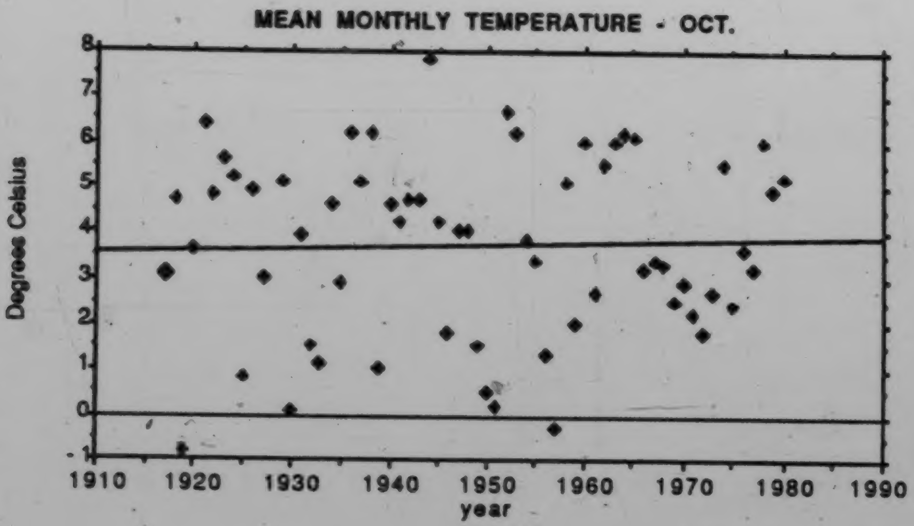


Figure 2g OCTOBER

Mean Monthly Temperature: 3.724°C
Standard Deviation: 1.964
Minimum Mean Monthly Temperature: -.8°C
Maximum Mean Monthly Temperature: 7.8°C
Correlation: .041

harvest. It is obvious why Edson area farmers say they do not consider the previous years´ weather when planning their next year´s strategy; the variation, in both temperature and rainfall, displayed at either end of the growing season is considerable.

No overall trends in temperature variability are evident, as only correlations approaching 1 or -1 would be considered significant. Farmers C, E and F said that the summers had become generally warmer, whereas Farmer D thought that they were cooler. Since the records show no clear trends, perhaps the farmers´ perceptions are due to high daily extremes which are not evident in these monthly means.

Total Monthly Precipitation

Monthly precipitation for the 1917 - 1980 period (Fig. 3) displays considerable variation. Maximum rainfall of 520.8 mm. and 519.8 mm. was recorded for 1954 and 1980, respectively. Four of the five farmers interviewed, who were farming at the time, recall vividly the high rainfall of 1954 and the loss in crop yield that resulted. None of them, however, recalled the large amount of rainfall in 1980. High rainfall was also recorded for 1931 (416.8mm), 1944 (489.5mm), 1965 (475.9mm) and 1971 (470.9mm) although none of these years were mentioned by the farmers. The large amount of rain in 1931 may have made, by contrast,

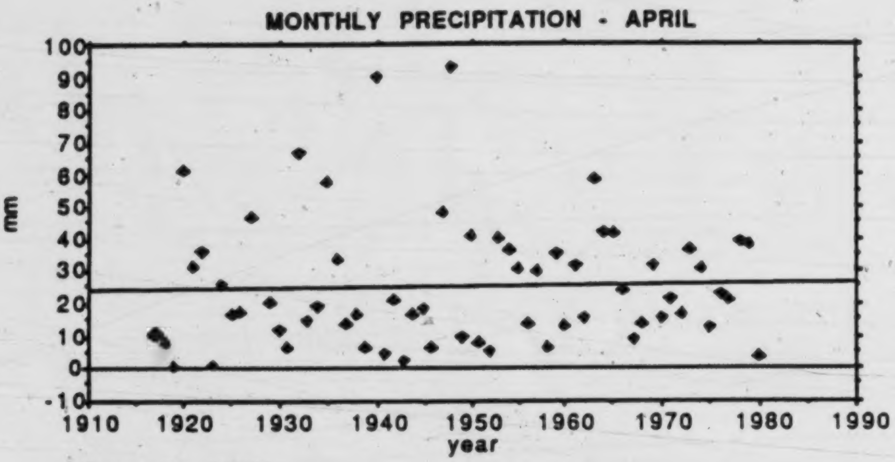


Figure 3a APRIL

Mean Monthly Precipitation: 25.378 mm.
Standard Deviation: 19.853
Minimum Monthly Precipitation: 0 mm.
Maximum Monthly Temperature: 93 mm.
Correlation: .27

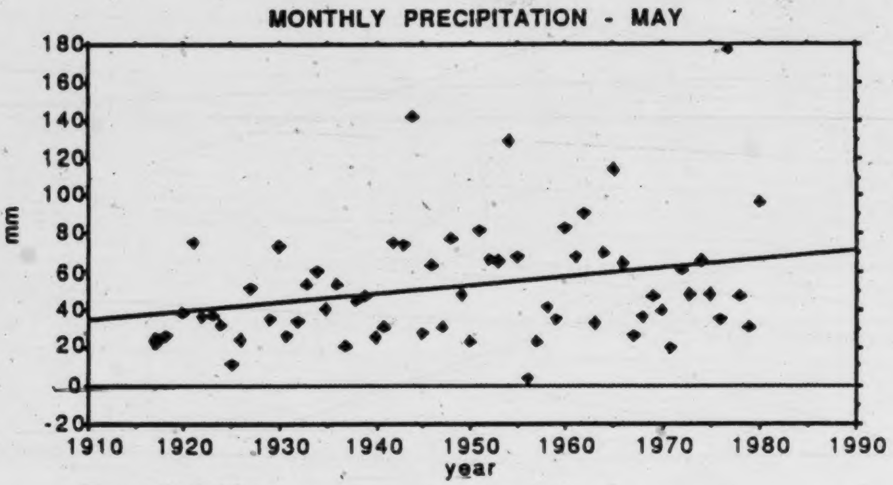


Figure 3b MAY

Mean Monthly Precipitation: 52.532 mm.
Standard Deviation: 31.558
Minimum Monthly Precipitation: 3 mm.
Maximum Monthly Precipitation: 176.3 mm.
Correlation: .27

FIGURE 3. VARIATION IN MONTHLY PRECIPITATION FOR THE EDSON REGION 1917-1980.
(Data obtained from Climatology, Environment Canada)

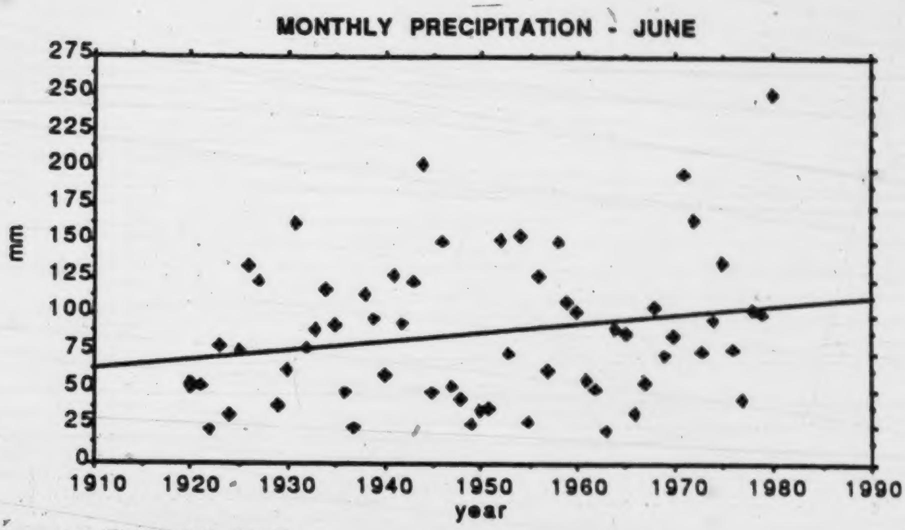


Figure 3d JUNE

Mean Monthly Precipitation: 88.348 mm.
Standard Deviation: 49.143
Minimum Monthly Precipitation: 20.3 mm.
Maximum Monthly Precipitation: 249 mm.
Correlation: .219

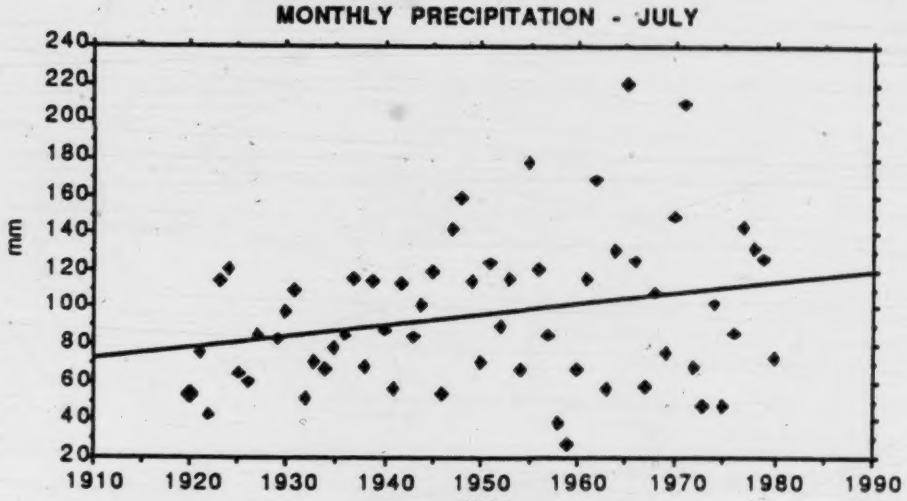


Figure 3d JULY

Mean Monthly Precipitation: 96.617 mm.
Standard Deviation: 40.338
Minimum Monthly Precipitation: 27.7 mm.
Maximum Monthly Precipitation: 219.7 mm.
Correlation: .255

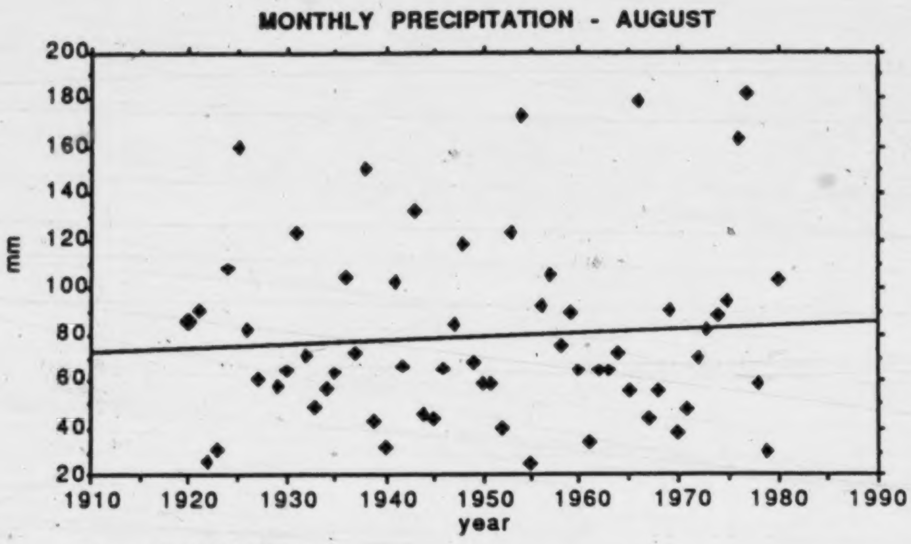


Figure 3e AUGUST

Mean Monthly Precipitation: 79.4 mm.
Standard Deviation: 39.12
Minimum Monthly Precipitation: 24.9 mm.
Maximum Monthly Precipitation: 181.3 mm.
Correlation: .075

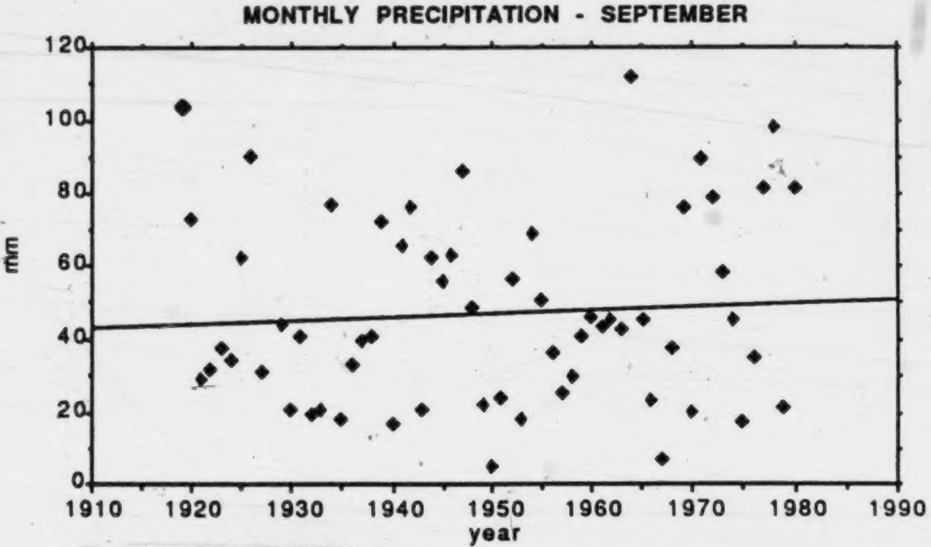


Figure 3f SEPTEMBER

Mean Monthly Precipitation: 47.282 mm.
Standard Deviation: 25.866
Minimum Monthly Precipitation: 4.3 mm.
Maximum Monthly Precipitation: 111.8 mm.
Correlation: .071

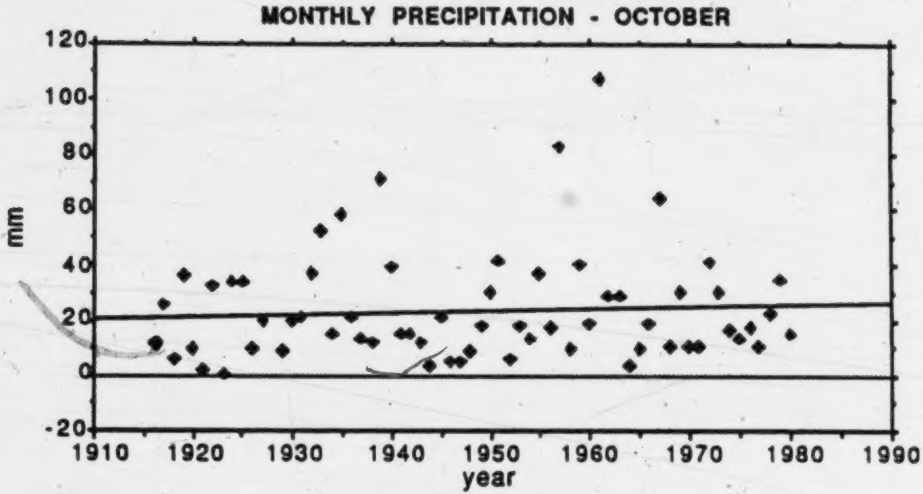


Figure 3g OCTOBER

Mean Monthly Precipitation: 23.459 mm.
Standard Deviation: 20.026
Minimum Monthly Precipitation: 0 mm.
Maximum Monthly Precipitation: 106.9 mm.
Correlation: .077

the rest of the 1930s seem relatively dry. According to the records, 1937 was the driest year of the decade, but does not represent the trend for the entire decade. Dry years were rarely mentioned in the farmers' accounts of bad years. It appears these farmers have never experienced drought. According to the records, the years of 1956 and 1963 were quite dry, but neither of these were mentioned.

The low correlations for all of the months of the growing season demonstrate a lack of temporal trend in the precipitation data. June, July and August consistently receive the most rainfall. This is ideal for crop growth, although it may interfere with cutting the first hay crop. There is considerable variation in September and October which could complicate the timing of the harvest. From circa 1957-1963, the amount of September precipitation was consistently low, ideal for a successful harvest. Since then, the rainfall amounts have varied widely on either side of the average.

The Growing Season and the Frost Free Period

The marginality of the Edson region is frequently blamed on the unreliable length of the growing season. The term 'growing season', however, is very subjective, because the onset of the season, for example, would vary according to the individual farmer's perception of when the land is ready to be worked. As expected, each of the informants had different perceptions of the length of the growing season (see Table III). Surprisingly, no one kept systematic records of climatic events such as frosts, droughts or harvest dates. The only personal records collected were the seeding dates, from 1965 to 1978, that Farmer C had written on the inside of his seed drill. The dates are as follows:

For wheat:

1965 - May 22
1966 - May 9
1967 - May 16
1968 - April 30
1969 - May 6
1970 - May 9
1971 - May 11
1972 - May 8
1973 - May 6
1975 - May 16
1977 - May 10
1978 - April 18

For oats:

1982 - June 12

For barley:

1974 - June 2

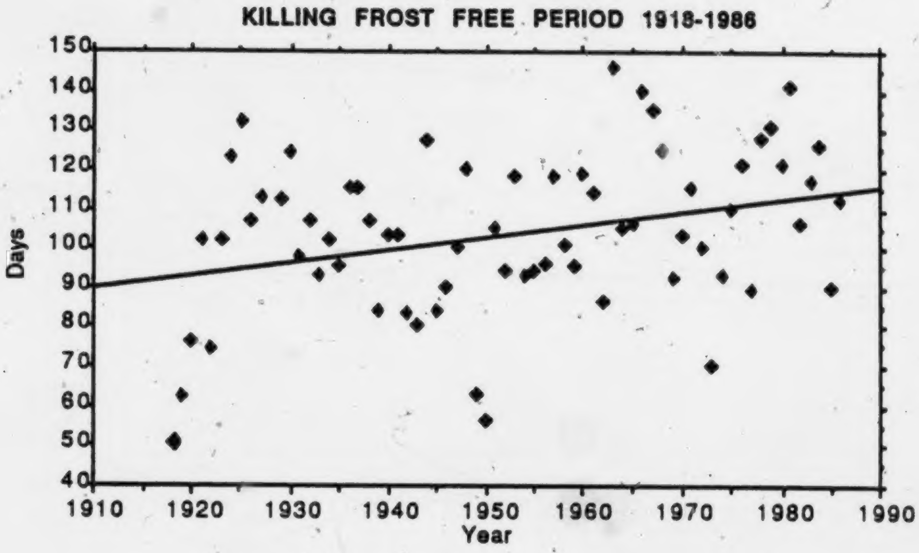
In the Edson area today, hay is usually seeded in mid May, oats and barley around May 15th, and wheat somewhat earlier. There seems to be considerable variation in seeding dates, which Farmer C considers to be the onset of the growing season. Unfortunately, harvest dates are unavailable.

Agriculture Alberta and Environment Canada do not collect data on the length of the growing season. Since the length of the growing season depends upon the date and intensity of frosts, records for the length of the frost free period was examined. Unfortunately these data proved to be of little value as they are calculated by

Environment Canada on the basis of those days with minimum daily temperatures below 0°C on either side of July 15. If there is a frost on July 14 and July 16, according to Environment Canada, the frost free period for that year is then one day, even though there may not have been a frost for weeks before or after.

Actual crop damage due to frost is hard to predict since it depends greatly on the humidity, the variety of crop being grown and the stage of crop growth. Still, the occurrence of frost and changes in the dates of killing frosts provide a measure of climatic variability and change. A killing frost free period was calculated from the mean daily temperature records as the number of days on either side of July 15 with temperatures above -2 ° C (Fig. 4). The killing frost free period has varied from 51 days in 1918, to 146 days in 1963, illustrating the unpredictability of the Edson growing season, which has a mean length of 103.79 days for the period of 1918-1986.

Even though the six farmers have all experienced the same regional weather patterns, each has recalled these patterns in very different ways. It appears they view climate change in terms of their farming operation, as an increase in frequency of short term difficulties (Whyte 1981:25). This approach, no doubt, affects their overall perception of climatic variation. These perceptions must have an affect on the way each farmer makes his/her



Mean Killing Frost Free Period: 103.794 days
Standard Deviation: 20.162
Minimum Killing Frost Free Period: 51 days
Maximum Killing Frost Free Period: 146 days
Correlation: .32

FIGURE 4. THE KILLING FROST FREE PERIOD FOR THE EDSON REGION 1918-1986.

(Data obtained from Climatology, Environment Canada.)

decisions regarding his/her operation. Although there is general agreement among some of the farmers on how the climate is or is not changing, no two perceptions are identical.

CHAPTER VI

THE INDIVIDUAL DECISION MAKING PROCESS

Selecting the Model

Investigating the role of perception in the individual decision making process will allow a better understanding of the culture-climate change relationship, yet this approach has not been used in the past. Studies have tended to focus on the collective level of culture change. At this level, a variety of different models has been proposed to describe the culture-climate change hypothesis. Impact models (Kates 1985:11) focus on climatic change exclusively and see it as the main determinant of human events. Such deterministic models do not allow a cultural or societal response to climate change. Interaction models, while they are more flexible in allowing for a response to climatic change, are much too general, in that the response occurs at the level of an entire society or population (Kates 1985:13). This makes them unsuitable for examining the role of the individual in the decision making or interactive process. Actor-based, processual models assume a high degree of conformity, that people act rationally and responsibly in making decisions, and that they keep cultural norms and rules in mind. While these models do emphasize the fact that the individual makes actual decisions and this forms the basis of cultural adaptation (Orlove 1980), individual decisions, clearly, do not always conform to the decision maker's cultural ideals, and depend largely on the goals of the individual.

Economic decision making models depend on man acting in a rational manner. They assume that the decision maker has the ability to "choose clearly and consistently those alternate courses of human behaviour that are most appropriate towards attaining some end or goal" (Kates 1962:13), usually to maximize profit (Chapman 1979:19). Simons (1957a:xxiii) states that such economic models attribute "a preposterously omniscent rationality" to man, who uses a "complete and consistent system of preference that allows him to choose among the alternatives open to him; he is always completely aware of what the alternatives are" (ibid). Such models, maintains Simon, have "little discernible relation to the actual or possible bahvaiour of flesh-and-blood human beings" (Simon 1957:axxiii). Although anthropologists tend to see rationality as the basis of the adaptive process (Burnham 1973:95), Chapman (1979) argues that truly rational man does not exist due to the varying influences pulling him in different directions. People simply are not as rational as these models require; people tend to satisfice, or choose alternatives which provide a satisfactory outcome, but not necessarily the optimal one in terms of profit (Heath 1976:75).

Whyte´s (1977:88) "simplified model of environmental perception" (presented in a modified version in Figure 5) provides for the deficiencies encountered in the other models. This model was constructed for specific use in environmental perception studies and was formulated so that a wide range of researchers could modify it to suit particular needs and circumstances. The components and organization of this model are particularly well suited to the present study since they recognize the individual resource manager as the basis of collective decisions. The main steps of the decision making process are represented by the circles. Influences which act on this process at various stages are represented by the boxes: individual influences below, and influences on resource managers as a collective and culture, above. These influences act on the decision maker at different points in the decision making process, depending on the particular circumstances of the decision. Not all aspects of the model may participate in any given decision. Since Whyte´s (1977) model describes both the way in which the individual makes a decision and how that decision enters

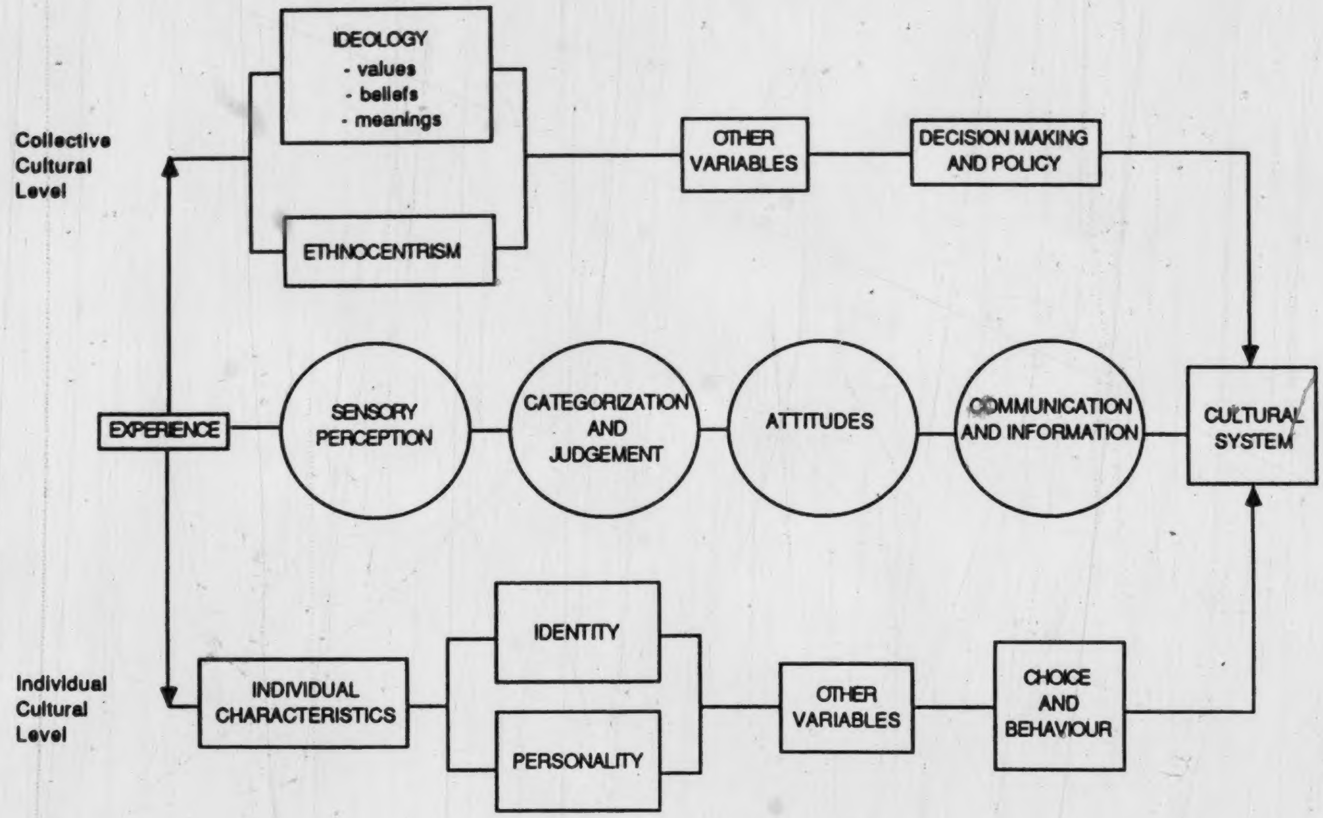

Collective
Cultural
Level
IDEOLOGY
- values
- beliefs
- meanings
ETHNOCENTRISM
OTHER VARIABLES
DECISION MAKING AND POLICY
EXPERIENCE
SENSORY PERCEPTION
CATEGORIZATION AND JUDGEMENT
ATTITUDES
COMMUNICATION AND INFORMATION
CULTURAL SYSTEM
Individual
Cultural
Level
INDIVIDUAL CHARACTERISTICS
IDENTITY
PERSONALITY
OTHER VARIABLES
CHOICE AND BEHAVIOUR

FIGURE 5. SIMPLIFIED MODEL OF ENVIRONMENTAL PERCEPTION . MODIFIED FROM WHYTE 1977:86.

at the level of collective change, it was used to describe the individual decision making process of the Edson area farmer (Fig. 6).

The Decision Making Process of the Edson Area Farmers

Introduction

In this section, the decision making process of the Edson area farmers will be described, making reference to the numbered steps and influences as indicated in Figure 6. Perceptions of risk, ideology, and the choice of technology of the farmers will also be discussed.

All of the Edson area farmers interviewed stated that their prime goal (1) is to maintain the lifestyle offered by living on the farm, which includes such benefits as working outdoors, "being your own boss" (p.c.), "working with nature" (p.c.), staying out of debt and being successful. It appears as though these farmers measure the success of their farm operation by the fact that they are still farming, and not in terms of economic success or income. They all made the comment that they are not on the farm to make money; if they wanted to be rich, they would move to the city and get a good paying job. Edson area farmers seem to maximize their chances for farm lifestyle maintenance in their decision making process, rather than maximize their chances of profit (Ortiz 1980:193).

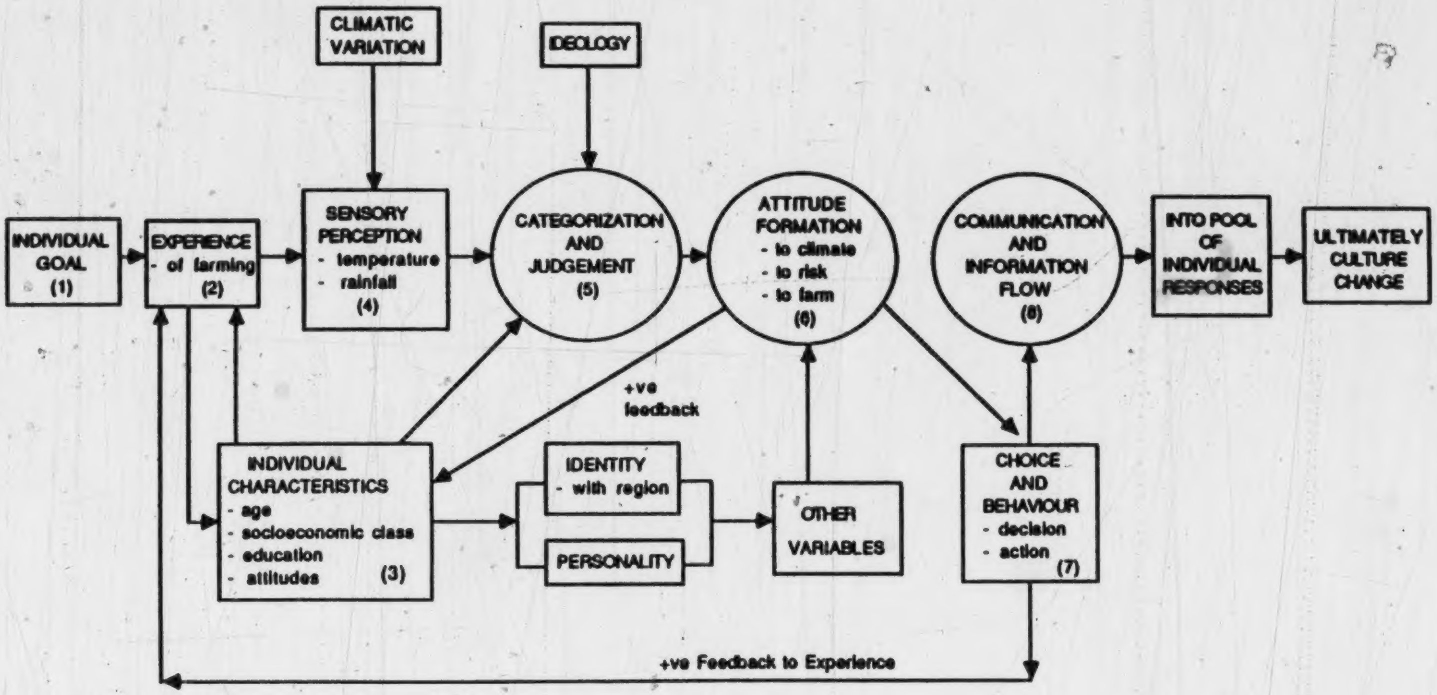

INDIVIDUAL GOAL (1)
EXPERIENCE - of farming (2)
CLIMATIC VARIATION
SENSORY PERCEPTION - temperature - rainfall (4)
IDEOLOGY
CATEGORIZATION AND JUDGEMENT (5)
ATTITUDE FORMATION - to climate - to risk - to farm (6)
COMMUNICATION AND INFORMATION FLOW (8)
INTO POOL OF INDIVIDUAL RESPONSES
ULTIMATELY CULTURE CHANGE
+ve feedback
INDIVIDUAL CHARACTERISTICS - age - socioeconomic class - education - attitudes (3)
IDENTITY - with region
PERSONALITY
OTHER VARIABLES
CHOICE AND BEHAVIOUR - decision - action (7)
+ve Feedback to Experience

FIGURE 6. MODEL OF PERCEPTION AND THE DECISION MAKING PROCESS OF INDIVIDUAL FARMERS OF THE EDSON REGION.

The farming experience of the individual (2) affects the way they plan their strategy. Each farmer knows what has worked best in the past and is familiar with the land, its soil, and the local environment. The effects of farming experience and individual characteristics (age, education) come into play before the initial sensory perception (4). These two factors (2 and 3) must, therefore, lead to decisions that are unique for each farmer. Whyte (1985:408) describes the individual characteristics and farming experience as the "decision frame" which includes all of the information the decision maker uses to make a particular choice. This thesis, however, is concerned only with the interpretation of the sensory perception and its role in the decision making process, not with the way the individual arrives at this interpretation based on their unique background. The presence of these background variables, however, needs to be acknowledged, as they are worthy of study in their own right.

Sensory perception of climatic variation (4) is the first actual step of the decision making process (Whyte 1977:91). But this includes two stages: sensory perception and cognition (5) (French 1963), these differing as one would distinguish between sensing and knowing something.

> "As experience becomes less immediate and the amount of inference by the organism increases, processes of cognition have become involved."
>
> French 1963:402

Cognition comes into play when you start using your cultural conceptual system to define or categorize objects around you (Frake 1972:192).

Categorization (5) represents the first step of the cognition process in which the observer arranges, in some order, the observed phenomena, by creating categories or classes which are meaningful to the individual (Whyte 1977:92). This process is directly influenced by the individual characteristics (3) and the farmer's prior farming experience (2), which forms the background against which the decisions are made.

Judgement (5) is the value assigned to the catagories or classes that have been formulated and it will vary considerably according to the importance each individual places on the categories (Whyte 1977:93). Factors such as probability (i.e. how likely something is to occur) or risk become important in assigning value to the categories. The attitudes (6), which can be described as beliefs, opinions, or feelings (Whyte 1977:93), that are formed towards risk are probably one of the most influential factors in the decision making process. A farmer's sense of his vulnerability to the environment has been shaped by past farming experience (2) and individual characteristics (3), and will, in turn, shape future judgement (5) of climate change. This process, whereby past experience (2) shapes judgements (5) and attitude formation (6), and the experience of making these judgements is added to past experience (2), can best be described as a loop (see Fig. 6). An individual's present attitudes (3) are used in categorizing and judging sensory perception (5) which may then result in the formation of new attitudes (6). These new attitudes form part of the individual characteristics (3) that will be used to deal with subsequent sensory perceptions.

Risk

Knight (1971:20) differentiates between risk and uncertainty. Risk, or measurable uncertainty, occurs when one lacks perfect knowledge but yet knows the probabilities of possible outcomes of an action or situation. Uncertainty, which is unmeasurable, describes situations where the probabilities of the possible outcomes cannot be specified. Risk means having some idea of the outcome, but with uncertainty, one has no idea of the outcome. In the case of the farmers of the Edson region, risk has a major influence on farm strategy planning.

Cancian (1980:166) found that the risk that farmers face in the production process deals mainly with climate.

However, when asked to assess the risks involved in farming in the Edson area, all of the farmers interviewed immediately dichotomized the risk (Table IV), adding risk due to uncertain prices, interests rates and government policies, to the risk of unfavourable weather. All six of the area farmers compared themselves to farmers in southern Alberta or Saskatchewan. Three of the six farmers maintain that the weather definitely does not constitute any major risk factor to their operation and that it is much more risky to farm in southern or eastern Alberta than in west central Alberta. They justify this by explaining that the Edson region is located in the boreal forest and is a mixed farming area. As a result, there is always a backup system, should the weather turn unfavourable and some part of their operation fail. In such an instance, if they could not count on the garden, they could turn to the resources of the forest. By hunting, fishing, collecting fruit, and preserving everything they could, they would always manage to get by. In southern Alberta, however, farmers invest everything in a grain crop. Should they experience a drought or grasshopper problem, they risk losing everything because they have no resources to fall back on due to their location on the prairie. They lack the advantage of a backup system (like the boreal forest) and must operate under a greater level of risk than the farmers in west

TABLE IV. SUMMARY OF FARMERS' PERCEPTIONS OF THE RISK INVOLVED IN FARMING IN THE EDSON REGION.

	RISK	COMMENTS
WEATHER		
3 Farmers (B, D, F)	Yes	- there is a certain amount of risk involved in farming everywhere. - there is a greater risk farming in the Edson region than in southern Alberta. - you have to live with it.
3 Farmers (A, C, E)	No	- it is more risky to farm in southern or eastern Alberta. - there is a natural "backup" system in the Edson region. - does not affect strategy planning because it is too variable and unpredictable
UNCERTAIN PRICES, INTEREST RATES AND GOVERNMENT POLICIES		
6	Yes	- risk of low prices, high interest rates outweighs any risk of climate change - affects planning strategy

central Alberta. These three informant farmers believe, then, that the weather definitely does not constitute any major risk factor to their operation.

The three other farmers replied that, yes, the weather in the Edson area does add a risk factor. Farmer B maintains that there is a certain amount of risk involved in farming everywhere, whereas Farmer D believes that the risk factor is greater in the Edson area than in southern Alberta because here there are more climatic variables to deal with. In the south, "all they have to worry about is drought and grasshoppers" (p.c.). According to Farmer F, the weather does consititute a risk factor, but it is something that "you have to live with." (p.c.).

It is interesting to note that when asked about the risk they face in farming around Edson, all farmers answered the question as if it referred to the risk of farm failure rather than the risk of climate variability affecting their operation. Each informant identified the financial aspect of farming as a high risk situation as it has the potential of leading to farm failure. The risk of low prices and high interest rates far outweighed the risk associated with climate change. All informants said that the major risk a farmer takes involves deciding how much money to invest in his operation at the onset of the season without knowing what the prices will be for that product come harvest time.

When asked about the effects that the risk factors had on their farming strategy, the farmers again answered the question in two parts. Concerning the possibility of adverse weather, the farmers said that they do not take this into account when planning their farm strategy because the climate is so unpredictable. They cannot count on the weather being consistent from one year to the next. There are aspects of their planning, however, that must include consideration of the possibility of climatic variability. A decision on which crop variety to seed, for example, reflects the farmer's perception of what he believes the climate may be like in the future. A decision of whether or not to choose an earlier maturing seed variety, which may have a lower yield than a later ripening variety, will depend on the farmer's perception of the next year's climate. One farmer (B) related the fact that he has hail insurance as a precaution against infrequent, but potentially serious, hail storms. In so doing, he minimizes stress and the risk of loss, should a hail storm occur. Yet earlier, this same farmer had made the comment that he does not take past weather into account when planning farm strategy.

With respect to the risk of falling prices, one farmer (C) stated that this definitely had an effect on his planning strategy. In 1985, for example, barley prices were quite low. In planning for 1986, he assumed, therefore, that the prices would still be low, and so he decreased the amount of fertilizer used on his barley fields to minimize the investment in a crop that might well have a very low return. Another farmer (C) has cattle insurance to minimize losses in the event of low cattle prices. These perceptions of risk, therefore, do have an effect on strategy planning, and are based primarily on past experience, combined with sensory perception.

When asked about the level of stress generated from the possibility of both climatic variation and low prices (Table V), all of the farmers replied that the weather did not cause them any stress at all. They explained that as a farmer, "you have to live day by day" and not worry about the weather because "you cannot change it. You can only deal with it once it happens." All of the farmers were of the opinion that they could deal with "anything the weather could throw at them" (p.c.). What makes them true farmers seems to be their ability to cope.

In reference to the level of stress caused by finances, all of the farmers admitted that this is their major source of worry. The instability of market prices and the bank interest rates jeopardize the money they invest in their operation and creates a risk which causes more stress than they ever feel from adverse weather.

TABLE V. SUMMARY OF FARMERS' PERCEPTIONS OF STRESS DUE TO RISK ASSOCIATED WITH FARMING IN THE EDSON REGION.

	STRESS	COMMENTS
WEATHER		
6 Farmers	No	- none: live day by day - deal with it when it happens
FINANCES		
6 Farmers	Yes	- the major source of worry - "stay out of debt"

Being in debt, either when they first started out or when purchasing new equipment, generated the greatest stress any of them ever felt. The only way to lead a relatively stress-free life, then, is to stay out of debt.

Ideology

Assessment of risk is also influenced, in a major way, by the ideology of the farmer. Bee (1974:154) considers values, beliefs, and meanings to be "the essence of ideology". The ideology of a person, or group of people, is composed of assumptions of what is true, correct, and of value in the mentality of people, of which they "may or may not be aware" or which "may or may not be true" (Walford 1979:19). These beliefs, or ideology, influence behaviour and can lead to the acceptance or rejection "of reason and evidence as guides to behaviour" (Walford 1979:9).

The effect of ideology is "wider and more pervasive than is recognized" (Walford 1979:10). "Each one of us has an ideology and it affects all our volitional behaviour, every action we perform with purpose or intention" (Walford 1979:10). People are often not aware they are acting on the basis of these assumptions, may think they are acting quite rationally, and are able to explain their actions as being totally rational (ibid), even though their behaviour may not be completely so.

Simon calls this the principle of "bounded rationality" (1957b:198) which maintains that the decision maker constructs a "simplified model of the real situation in order to deal with it. He behaves rationally with respect to this model, and such behaviour is not even approximately optimal with respect to the real world" (Simon 1957b:198). In this manner, our volitional behaviour is "affected by ideas and beliefs, as well as other items of cognition" (Walford 1979:21) which directs our behaviour.

Although each person has his/her own unique, personal ideology, each person is also identified with a shared ideology. When these ideologies are shared, the people who share them are said to belong to an "ideological group" (Walford 1979:23).

Ideology has a prevailing influence in all decisions, whether made by an individual or a group. It is important, therefore, to document the ideology of the Edson area farmers and its influence on their decision making strategy. Both the concepts of individual ideology and ideological group are useful for this purpose.

All of the farmers interviewed possess a similar, basic ideology regarding farm operation and farm life. As an ideological group, they share a number of beliefs and values which are summarized on Table VI. They share an underlying sense of optimism and a positive mental attitude which allows them to cope with the challenges of the area. In this way, they are able to cope with any risk or uncertainty caused by the weather, which undeniably exists, but which the farmers downplay. They acknowledge, for example, that the risk of early or late frost is high, but they do not consider that to be a major problem until it happens. By using a form of bounded rationalization which is based on their beliefs that "weather is a natural thing to worry about", and "take it one day at a time" (in reference to the weather), they can remain on the farm and not suffer the potential stress that may occur if the true extent of the risk is acknowledged.

Their ideology influences the farmers' perception of the risk of climate change. They believe that the weather "is not a problem until it happens" and they see this as the logical response to their situation. They seem to deny that the risk exists and only accept the consequences as manageable. If they were to admit the true amount of risk involved in farming in the Edson region, they would, in all likelihood, leave. Their ideology, however, helps them to cope with this risk and set up a logic that allows them to remain on the farm. This ideology system is shared among the region's farmers and seems to be perpetuated through non-corporate groups, be they farmers' self-interest groups or local sports clubs, in which

TABLE VI. THE BASIC IDEOLOGY SHARED BY THE FARMERS OF THE EDSON REGION.

BELIEFS

Weather
- "There's nothing you can do about the weather"
- "take one day at a time"
- the weather is "natural to worry about"
- weather is not a major factor in strategy plannning
- the weather does not present a risk

Farming
- "there is no poor land, only poor farmers"
- farmers live on the land
- farmers have proved themselves; people who leave the farm were never 'true' farmers
- farming is "born in you", is "in your blood"
- farming is "a way of life"
- farmers "don't dwell on bad years"
- farmers listen to the advice of other farmers
- farmers take the good with the bad
- a good farmer always has a carry-over in case of a bad year

Nature
- the boreal forest will "see you through poor times"
- knowing nature is the key to farming
- knowing the soil is important

Other
- "to worry about money is unnatural"
- agricultural representatives do not know much

VALUES

- the lifestyle of farming
- "being your own boss"
- working with nature
- knowing nature's signs
- being successful
- staying out of debt
- your neighbour's advice
- a backup system
- farmers' groups
- sharing knowledge
- knowing the environment
- positive attitude/optimism

MEANINGS

- a successful farmer = one who has perservered and stayed on the farm
  = lives on the farm

all of the farmers are involved. Here, they mutually reinforce their ideology through community networks and stress the importance of listening to the advice of other farmers in the area.

The six farmers interviewed also shared a definition of what a ´true´ farmer is (see Table VII). All of them agree that a true farmer is one who never gives up; he remains on the farm, no matter what. Those who gave up farming "were never real farmers" (p.c.). This definition of success, measured in terms of perserverance and continuation of farming activity, was also found by Saarinen (1966) among farmers on the Great Plains. It appears that both of these groups of farmers share a common goal of maintaining their farm lifestyle. In this way, they are "satisficing" (Ilbery 1985:8); they are making decisions based on their attitudes, motivations and aspirations, notably, their desire to maintain their lifestyle (which is the important factor according to their ideology) rather than optimizing, that is, making decisions for the purpose of maximizing profit. All of the decisions they make can be rationalized on the basis of their ideology.

According to the Edson area farmers, a true farmer lives on the land and is able to successfully maintain the farm lifestyle. This includes working on the land and observing nature. A true farmer has also been able to

TABLE VII. QUALIFICATIONS OF A ´TRUE FARMER´ ACCORDING TO THE EDSON AREA FARMERS.

"YOU ARE A FARMER iff* YOU ARE A RESIDENT
& HAVE PROVED YOURSELF"

(*iff= if and only if)

Where the following definitions hold true:

1) YOU HAVE PROVED YOURSELF iff:

- YOU KNOW NATURE
- YOU APPLY NATURE
- YOU ARE NOT FORCED OFF THE FARM FOR FINANCIAL REASONS

2) YOU ARE A RESIDENT iff:

- YOU MAINTAIN A FARM LIFESTYLE
- YOU LIVE ON THE LAND

3) YOU MAINTAIN FARM LIFESTYLE iff:

- YOU WORK LAND
- YOU OBSERVE NATURE

to prove himself in the sense of applying his knowledge of nature and the land to his farm strategy, which results in his being able to maintain the lifestyle and stay on the land. A person who has had to abandon the farm, particularly for financial reasons (and it should be pointed out that crop failure or a poor harvest can lead to financial problems), was never a true farmer at all.

The one point of contention regarding the definition of a true farmer, in the eyes of the Edson area farmers, is the matter of off-farm work. Of the six informants, four of them (A, B, C, and F) have never worked off the farm and think that this is an indication that they are running a successful farm operation. Hence, they are true farmers. The other two farmers (D and E) have had to work off the farm and are of the opinion that, in the Edson area, this extra income is necessary because farmers there cannot make enough money from farming alone. They do regard themselves as being true farmers.

This definition of a farmer is an important part of the ideology of the farmers and has important consequences in the individual decision making process. It allows all farmers to maintain an opinion of themselves as farmers, regardless of whether or not they also have to work off the farm.

Choice of Technology

In the decision making model (Fig. 6), once the judgements (5) have been placed on the classes that were formulated in the categorization process, attitudes towards those classes are formed (6). At this point, a range of perceived alternatives is formulated, representing the process of choice and behaviour (7). Alternatives might include whether or not to adapt a new strategy, what type of technology to use, or whether or not to change the timing of an activity.

In the Edson region, it is interesting to note that although the farmers are limited to the same basic farm practices, such as the timing of various operations and choosing seed varieties, the variability in their attitudes in applying technology is evident. Each of the six farmers interviewed use different technological strategies in their farm operations. Two of the farmers (B and C) stress the importance of incorporating high technology into their operation in order to successfully beat the season, for it allows them to do more, and to do it faster. By frequently upgrading their machinery, they make sure they have back-up units ready in case of breakdown. By using the most efficient machinery, in terms of fewest trips in the field, their chances of beating the season are greatly improved and they are more assured of harvesting their crop before fall frosts. These farmers are willing to risk indebtedness if they can better assure a successful and profitable harvest. To them, a good crop is a good return on their investment.

Two of the farmers (E and F) believe that by keeping machinery purchases to a minimum and their operations fairly simple, they can save money in terms of investment in machinery. They can keep their debts down, while at the same time, maintaining a fair level of technology to ensure a quick harvest.

The final two farmers (A and D) believe in using only the very basic technology i.e. they only buy what is absolutely necessary. Each has owned only one or two tractors in their entire farming careers and believes that by being thrifty in terms of money saved and by using a good, economical strategy, their chances of success are maintained while the risk of debt is decreased. It is the fear of debt that all of the farmers have in common, yet all of them strategize in terms of technology to deal with that fear in very different ways.

Other alternatives open to the farmer include whether or not to use fertilizer, and if so, what type. Four of the farmers (A, B, C, E) believe that chemical fertilizers are a real asset in producing good crops. The other two (D and F) believe that chemical fertilizer is bad for the soil and insist on using the natural fertilizer, manure. In these instances, attitudes towards various alternatives differ considerably.

In the model, a choice, which directs action or behaviour, is made from the set of perceived alternatives. These individual choices and subsequent behaviours then become part of the communication and information flow (8) between two or more individuals or within communities which is what happens when neighbours exchange ideas or attend farmers' meetings. This step represents the onset of the process of culture change; it is the transition point between the level of the individual and the collective level of culture. The culture change process has its foundation in this pool of individual decisions.

This model works well as a heuristic device to link the individual decision making process, based on climate perception, to a collective response, or culture change. It describes the step by step process and the influences on the progression from the level of the individual to the level of culture change. It is obvious that the culture change process begins with the individual and that it is at that basic level that an investigation of the culture change process, particularly with relation to climate change, must necessarily begin.

CHAPTER VII

CONCLUSIONS

The culture change-climate change hypothesis assumes that culture responds to climate change and variation in a direct and rational manner, yet according to the data presented here, this is not likely. As Chapman (1979) emphasizes, due to varying influences, truly rational man does not exist and, therefore, one cannot assume that decision making is a rational, predictable process. This is the assumption, however, that underlies deterministic interpretations of the relationship between climate change and culture change. The individual perception process complicates this seemingly direct relationship and verifies that further investigation into this aspect of the climate change-culture change relationship is warranted, in order to fully understand the complexities involved.

A number of conclusions can be drawn regarding individual perception and decision making from this study of farmers of the Edson region.

1. Chapman (1979:15) states that the decision making

process starts with a personal goal in mind. For the Edson area farmers, that goal is lifestyle maintenance. The decisions each farmer makes regarding his operation will reflect that goal and perceived success is also measured in terms of that goal. This coincides with the findings of Heath (1976:75) that individual farmers tend to satisfice: that is, choose the alternative which provides a satisfactory outcome, but not necessarily the optimal one in terms of profit.

2. The past farming experience of a farmer, including past perceptions and attitudes, affects the way he plans his future strategy. Attitudes towards risk have a major influence on strategy planning; they have been shaped by past farming experience and individual characteristics which, in turn, shape future attitudes and judgements.

3. The Edson area farmers deny that the risk posed by climate variability exists. In this manner, they accept the risk of climate variation as something they cannot alter and must deal with as it happens. The denial of the risk posed by climate helps them to cope with the limited options available to them.

4. Edson area farmers consider the financial aspects of farming to be of a much higher risk and stress value than climate variation.

5. The actual yearly variation in temperature, rainfall, and the frost free period shows the unpredictability in

climate that the area's farmers must face. It is assumed that farmers make decisions based on their familiarity with the region and in the context of recognized, broad, seasonal changes; that is, they do use their basic background knowledge of the region when making a decision. All of the farmers, however, state they do not take into account the weather of the past in planning future strategies. Some of them do take measures, such as taking out hail insurance, which would indicate that they are aware of the potential risk posed by the climate and, therefore, act accordingly.

6. Even though various technologies are available, they may or may not be adopted; the decision whether or not to adopt a new technology depends largely on the individual farmer's attitudes and opinions. The variability in the level of technology that each farmer considers to be advantageous offsets the conformity that exists among the farmers. This conformity results from the marginality of the area, compounded by the ideology shared by the farmers of the region, both of which promote conformity in certain aspects of farm operations. Whereas all six of the farmers conform to basic farm practices, there is variability in their choices and application of technology. It would seem that their ideology does not include beliefs regarding the adaptation of new technology; these beliefs vary according to the individual

farmer. Two of the farmers have opted for the use of high technology while the other four keep their operations relatively simple. All of the farmers are striving to maintain a good relationship with their environment and are willing to make adjustments to their strategy, but the way they maintain this relationship varies (Saarinen 1966:3). In the event of a climatic extreme, it is not clear whether whether basic farm practices would see these farmers through, or whether success would depend on the level of technology used by the individual farmer.

7. Ideology allows these farmers to persist in farming in the Edson area despite the decrease in the range of options available to them due to the marginality of the region. This ideology seems to be perpetuated through the local farmers' groups and through discussions between neighbours. The denial of marginality, part of the ideological system of the farmers, serves as a coping mechanism.

8. Climate perception varies according to the individual farmer. Methods used to cope with perceived change varies with the individual; each reacts to it in their own way, according to their own personal experience.

From these conclusions based on individual perception, a number of conclusions can be drawn regarding the individual, and his relationship to culture change in light of climatic variation.

9. Individual decisions cannot be predicted. The perception of climatic variation differs according to the individual and many factors influence the decision making process. Predicting the outcome of individual decisions and the direction of culture change based on certain changes in climate is quite unrealistic.

10. Similiar climatic variations will result in different decisions by one individual under different sets of individual experience and circumstances.

11. The unpredictability of the individual decision making process complicates the seemingly direct relationship between culture change and climate change.

12. A change in climate results in individual response. This response is the result of the perception of the change in a unique decision making process. These responses accumulate and ultimately direct a collective response to that change.

13. By modelling the individual decision making process, the way individual responses are made and accumulate to produce culture change can be better understood. The analysis of the individual decision making process will help to clarify the link between the action of individuals and the direction of culture change (Bee 1974:231).

14. One cannot assume that the temporal coincidence of culture and climate change as proof of cause and effect. Culture change cannot be solely attributed to climate

change. When they do occur simultaneously, other contributors to that culture change must be sought, as demonstrated by the research of Parry and Ogilvie.

15. The use of a high resolution situation where "rates of cultural and environmental change can be precisely determined", as recommended by Schweger (1987), is ideal for studying individual perception and decision making. An agricultural setting is ideal as farming is dependent on climate and the success of the individual farming operation depends on the ability of the farmer to perceive and react to climatic variation in a manner appropriate to his farm strategy.

16. There have been no studies which focus on the individual response to climate perception as the basis of culture change until now. Only by understanding this basic level of culture change, however, can the culture-climate change relationship be understood. By so doing, we can start to link together individual behaviour and cultural adaptation to changes in the environment (Orlove 1980:262).

In the broad sense, humans and culture are limited by environmental factors. There are, however, a wide variety of possible lifeways that can be used to deal with those factors (Watson et al 1984:120) and that is where individual choice is important. "Culture can be significantly independent of environment even when there are many dependent relations between the two" (Watson et al 1984:120). Climate is not deterministic; it gives a bias to the direction and success of decisions (Bryson and Padoch 1980:583). The environment sets the limits that provide opportunities for culture but does not "directly determine cultural details" (Watson et al 1984:120). That is the responsibility of the individual decision maker.

Possibilities for Future Investigation

Farmers act as individuals in the way they perceive and react to climatic variation. They make decisions based on an initial goal of maintaining their lifestyle and have a definite ideology of farming to help them cope. How might this information on individual perception, culture change, and climate change be investigated and utilized?

When researchers are investigating the prehistoric record and uncover evidence of land abandonment, it is often assumed that the migration out occurred over a short period of time. In light of the data presented here, it would seem that individual farmers make their own unique decisions and, disregarding catastrophism, a simultaneous out-migration of all of the farmers in an area would be highly unlikely. It would be very worthwhile to investigate a means by which this gradual migration of people might be detected in the archaeological record.

The important role that ideology plays in the decision making process of the farmer has been realized here. It would be interesting to investigate how an ideology might be represented in the archaeological record. Is there a way that a change in ideology over time could be detected in terms of artifacts or strategies?

Individual farmers make decisions according to how vulnerable they perceive themselves to be with regard to climatic variation (Parry 1978:22). By investigating the perceived vulnerability farmers have of themselves today, a useful analogy might be constructed that could be used in interpreting the prehistoric record. It is the farmer's perceived vulnerability of his own situation which affects his decisions. Interpreting the prehistoric record as a non-farming researcher today, the vulnerability of the population under study may well be overestimated.

This model of the individual farmer's perception and decision making process with regard to climatic variation/change might also be used in dealing with future climatic variation and change. Certain climatologists predict future changes in climate that will place major stress on agricultural systems (Parry 1978:20). The way farmers behave under adverse circumstances is of great importance to planners and economists in order to determine appropriate policies

(Ortiz 1980:177). By understanding the way farmers perceive and react to climatic variation and the way these decisions accumulate and produce culture change, agricultural authorities may be better prepared for the possible consequences of climatic variation in farming communities.

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APPENDIX I

A SAMPLE OF QUESTIONS ASKED TO EDSON AREA FARMERS.

1. When did you start to farm?

2. Why did you choose the Edson area?

3. What sort of operation did you have when you first started to farm? What were the first crops you planted?

4. What do you grow today? Rotations, varieties etc.

5. Do you use fertilizer? If so, when did you start to use it and why? Does it improve your yields significantly? If not, why not?

6. Do you incorporate fallowing into your crop rotation?

7. What sort of equipment do you use? Do you like a lot of machinery? Why/why not?

8. What is the risk involved in farming here? Is the weather a major factor? What other factors increase the risk?

9. Do you feel any stress farming in this area? Why? What do you do to deal with it?

10. Do you remember any particularly good years or bad years? Re: weather and crops?

11. Have you noticed any changes in the weather over the years? Any trends? Do you think it will continue to change in the future? Do you use this information in planning the upcoming year's strategy?

12. Do you think this area is marginal for agriculture?
13. Do you attend local farmers' meetings?
14. Have you ever had to work off the farm?
15. What are the keys to farming in this area?

Additional questions were asked as applicable.